User s Guide for the Naval Communications Assessment Tool (NCAT) Software Version 3.0

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1. SCOPE

1.1 IDENTIFICATION

This User's Guide (UG) provides instructions to execute the Naval Communications Assessment Tool (NCAT) Software Version (SV) 3.0 of the Coverage Prediction Improvement Program (CPIP).

1.2 SYSTEM OVERVIEW

NCAT can determine the optimum time to receive a very-low-frequency/low-frequency/extremely low-frequency (VLF/LF/ELF) or high-frequency (HF) transmission, allocate VLF/LF/ELF or HF transmitters to deployed submarines, mitigate the effects of transmitter downtime on coverage and connectivity, and aid in determining the optimum frequency and location for existing and new VLF/LF/ELF and HF transmitters. It can also be used to view dynamic coverage charts. NCAT generates coverage charts that geographically show coverage as a function of a user-defined operating area. NCAT also generates histograms that show specific coverage for user-selected areas.

NCAT generates the following types of analysis:

A percentage of full-power histogram that displays the percentage of full power required for the selected transmitter(s) to fully cover the selected operating area(s).

A signal-to-noise ratio (SNR) histogram that shows the transmitter(s) signal levels, in decibels (dB), for the selected operating area(s).

A composite maximum or minimum SNR histogram that shows the level of the transmitter with the highest or lowest SNR ratio, in decibels (dB), for the selected operating area(s) during each 30-minute interval.

A minimum-power histogram that shows the minimum power level, in kilowatts (kW), required by the selected transmitter(s) to cover the selected operating area(s).

A time availability chart that shows the periods of copy/no copy for the selected transmitter/operating area pairs.

A percentage of ocean area covered chart that shows the percentage of the selected ocean area that is covered by the selected transmitters in 30-minute intervals.

Coverage charts (both single and joint coverage) that show the areas in which signal copy is possible for the selected transmitters.

Hours of copy summary coverage charts.

NCAT is a Windows 9x®/NT® program. It requires Windows 95®/98® or Windows NT® version 4.0 or higher. NCAT provides a full Graphical User Interface (GUI) through which all user/program interaction occurs. Context-sensitive online help is always available.

NCAT can only be used with pre-generated transmitter data sets. For each transmitter included in the NCAT distribution, a series of 96 data files are generated for each of the four seasons (December–February, March–May, June–August, and September–November). The NCAT program uses these

data files to determine the required power or SNRs for the selected operating areas. The NCAT program cannot generate these data files.

This document assumes familiarity with Windows (or a similar windowing environment). The user should consult the Windows User's Manual and online help for assistance in using the Windows operating system.

1.3 DOCUMENT OVERVIEW

This UG provides the steps for executing the software, the expected output, and the action to take if error messages appear. The information provided in this UG is directed to the functional user of NCAT. The UG is organized as follows:

- Section 1, Scope, identifies the program to which this UG applies and provides a brief description of this UG.

- Section 2, Referenced Documents, provides a list of the specific version of all documents referenced in this UG.

- Section 3, Prerequisites, identifies the minimum hardware and software requirements for operating the NCAT and describes the installation of the NCAT program.

- Section 4, Basic Menu Operations, presents the information and instructions necessary for user interaction with NCAT to carry out software operations.

- Section 5, Creating a Scenario for Analysis, describes the step-by-step procedures and identifies available user options.

- Section 6, Running a Scenario, describes the available analysis types and how they are performed.

- Section 7, Modifying a Transmitter's Characteristics, provides instructions for modifying transmitter characteristics are adjustable by the user.

- Section 8, Examples, provides step-by-step examples of NCAT capabilities.

- Section 9, User Preferences, provides instructions on using the preferences notebook.

- Section 10, Notes, identifies points of contact for technical assistance, provides the distribution statement, and describes known limitations. This section also presents an alphabetical listing of all acronyms, abbreviations, and their meanings as used in this document.

2. REFERENCED DOCUMENTS

The following documents were used in the preparation of this guide or referenced in this guide:

a. Windows NT® *Installation Guide*. 1996. Microsoft Press, Seattle, WA.

3. PREREQUISITES

3.1 HARDWARE/SOFTWARE REQUIREMENTS

The NCAT program has the following minimum requirements.

Hardware:

- Pentium 90 MHz or higher Intel (or compatible) Central Processing Unit (CPU).

- 16 megabytes (MB) of Random Access Memory (RAM) (32 MB is recommended).

- Super VGA Graphics Array (SVGA) color graphics at 640 x 480 resolution using at least 256 colors. A graphics resolution of 1024 x 768 and 16-bit color is recommended.

- Any Windows-compatible graphics printer (black and white or color) for hard copy.

- 4 MB of free hard drive space for the NCAT program.

- 20 MB of hard drive space for each VLF/LF transmitter included in the database.

- 135 MB of hard drive space for each HF transmitter included in the database.

- 405 MB of hard drive space for the installation of the ELF database.

Software:

- Windows 95$^{®}$ or NT$^{®}$ 4.0 (recommended).

- NCAT Installation CD-ROM.

3.2 INSTALLATION

Follow these steps to install the NCAT program:

Insert NCAT Installation CD into the CD-ROM drive.

Use Explorer to access the CDROM drive and double-click on the Install.exe program file.

Follow the onscreen instructions to install the program and its data.

Once the program and data are installed, you must create a shortcut to the ncat.exe program. Use Explorer to access the directory in which the NCAT program was installed (c:\ncatv20, if drive C was used to install the program) and press the right mouse button on the file called "**ncat.exe**". Hold down the right mouse button, drag the selected file onto an open space on the desktop, and then release the mouse button. A menu appears; select the "Create a Shortcut" menu item. The NCAT program should now be located on the desktop for use.

NOTE: If you decide to re-install the program or new data files, you will have to re-select ALL the transmitters that you wish the program to use. The installation program does a total re-installation of the program and does not remember which files were previously installed.

This concludes the NCAT program installation.

Follow these steps to install the ELF database that is included on a separate classified CD-ROM:

1. Insert the ELF Installation CD into the CD-ROM drive.
2. Use Explorer to access the CD-ROM drive and double-click on the Install.exe program file.
3. Follow the onscreen instructions to install the program and its data.

4. BASIC MENU OPERATIONS

The NCAT program uses a GUI to obtain user inputs and display results. Unless otherwise indicated, all mouse operations require a single click of the left mouse button. To access the menus, the mouse is fully supported, as are keyboard shortcuts for the more experienced Windows user. Keyboard shortcuts are the underlined letter for each menu item, as shown in the figures and the textual reference(s) to that menu item. To use the keyboard shortcuts, press the Alt key while pressing the underlined letter.

To begin an NCAT session, either type **NCAT** in a Command Prompt window or select the NCAT icon from the Windows desktop. The program begins by presenting the user with the main menu selection screen (figure 1). The items presented on the main menu selection screen are described in the following subsections.
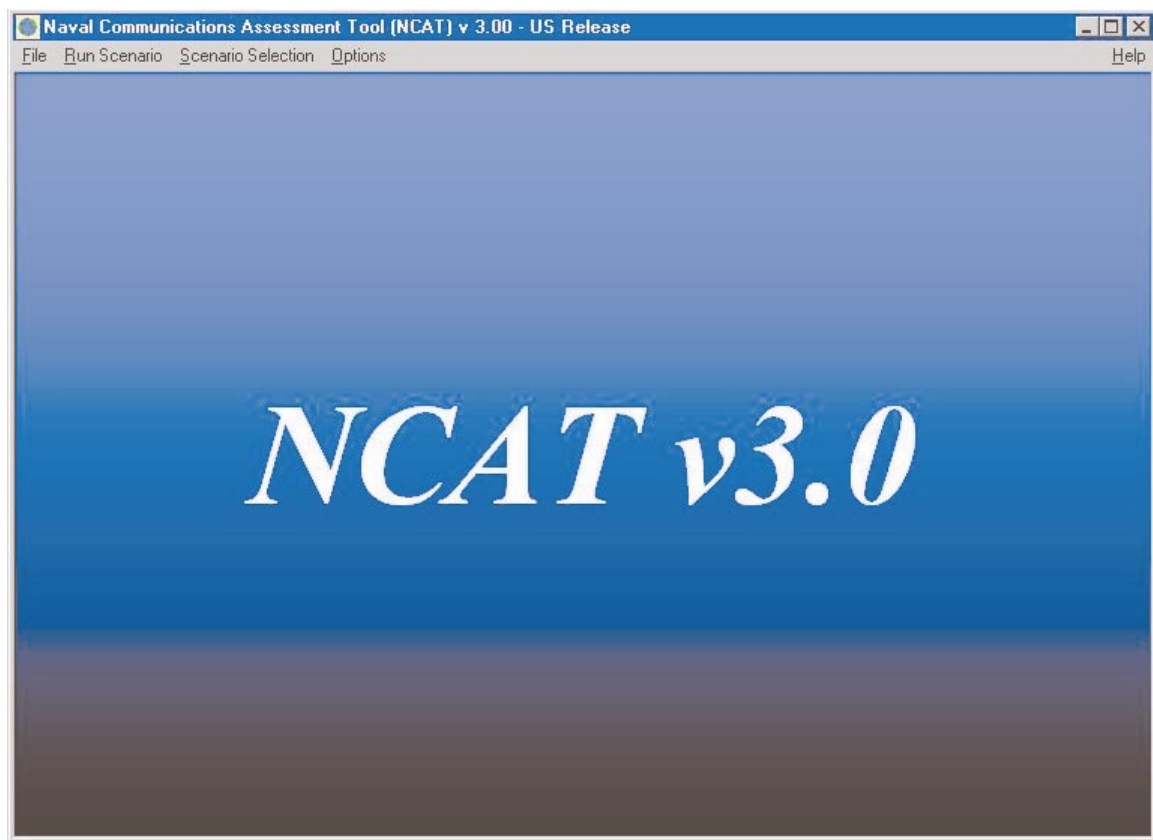
Figure 1. NCAT main menu selection screen.

4.1 FILE

The File menu item is used to select file-related items. This menu (figure 2) contains five submenu items. The following subsections describe the File menu item submenus.
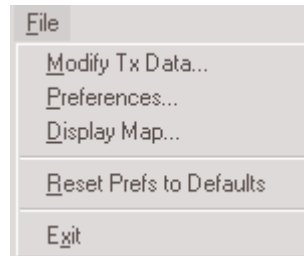
Figure 2. File menu screen.

4.1.1 Modify Tx Data

The ***Modify Tx Data***... submenu item modifies a transmitter's predefined characteristics (i.e., its maximum radiated power in kW and its transmission mode). Section 7 provides instructions for modifying these characteristics.

4.1.2 Preferences

The ***Preferences***... submenu item is used to select and modify the program's preferences (such as the default map type, season, transmitter, etc.). Section 9 explains the preferences notebook.

4.1.3 Display Map

The ***Display Map*** submenu item displays the selected map. The operator can generate a hard copy of the map used for the analysis without any coverage chart contours generated on the map.

4.1.4 Reset Prefs to Defaults

The ***Reset Prefs to Defaults*** submenu item resets the preferences file to the default NCAT values.

4.1.5 Exit

The ***Exit*** submenu item exits the program. When this menu item is selected, the NCAT program exits immediately. The Alt-F4 function key or the "X" button in the upper right corner of the window also exits the program.

4.2 RUN SCENARIO

The Run Scenario menu item performs a specific type of analysis using inputs from the Scenario Selection menu items. This menu contains three submenus (figure 3). The following subsections describe these submenus.

```
Show SNR...
Show Composite SNR...
Show Composite SNR (MIN)...
Show Composite SNR (MAX)...
Show Power Levels...
Show Percent Power...
Show Time Availability...
Show 4 Seasons...

Show Single Coverage...
Show Joint Coverage...

Show Hours of Copy...
Show Percent Ocean Covered    ▶
```

Figure 3. Run scenario menu screen

4.2.1 Show S<u>N</u>R

The *Show S<u>NR</u>...* submenu item displays a histogram of the minimum SNR for each selected transmitter(s) to the combined selected operating area(s).

4.2.2 Show <u>C</u>omposite SNR

The *Show <u>Composite SNR</u>*.... submenu item displays a single coverage chart that shows the SNR for each selected transmitter. Each transmitter is color-coded for easy identification.

4.2.3 Show Composite SNR (MI<u>N</u>)

The *Show Composite SNR (MI<u>N</u>)*.... submenu item displays a single coverage chart that shows the transmitter that provides the least amount of coverage for the selected operating areas during each 30-minute interval.

4.2.4 Show Composite SNR (MA<u>X</u>)

The *Show Composite SNR (MA<u>X</u>)*... submenu item displays a single coverage chart that shows the transmitter that provides the greatest amount of coverage for the selected operating areas during each 30-minute interval.

4.2.5 Show Power <u>L</u>evels

The *Show Power <u>Levels</u>*... submenu item displays a histogram of the radiated power (in kW) required for each selected transmitter(s) to fully cover all of the selected operating area(s).

4.2.6 Show <u>P</u>ercent of Power

The *Show <u>Percent Power</u>*... submenu item displays a histogram of the percentage of full power of the selected transmitter(s) that is required to fully cover all of the selected operating area(s).

4.2.7 Show Time Availability

The ***Show Time Availability***... submenu item displays a series of charts that show periods of copy/no copy for all of the selected transmitter(s) and operating area combinations.

4.2.8 Show 4 Seasons

The ***Show 4 Seasons***… submenu item displays a series of SNR coverage charts that SNRs for the selected transmitter(s) in each of the four seasons.

4.2.9 Show Single Coverage

The ***Show Single Coverage***... submenu item produces a dynamic display of coverage charts sequential in time over a 24-hour period at a selected time resolution for a single transmitter in the specified map area.

4.2.10 Show Joint Coverage

The ***Show Joint Coverage***... submenu item produces a dynamic display of joint coverage charts sequential in time over a 24-hour period at a selected time resolution for the selected transmitters (two to four) in the specified map area.

4.2.11 Show Hours of Copy

The ***Show Hours of Copy***… submenu item displays the hours of copy summary coverage chart for a single transmitter in the specified map area.

4.2.12 Show Percent Ocean Covered

The ***Show Percent Ocean Covered*** menu item displays the percentage of ocean area that is covered by the selected transmitter(s) in the selected map area. The program can display the results in a graphical or tabular format.

4.3 SCENARIO SELECTION

The Scenario Selection menu item (figure 4) defines a scenario for analysis. The Scenario Selection contains six submenus that allow the user to select from the following parameters:

- One or more transmitters and one or more transmission modes for each selected transmitter.

- One or more receiver locations and/or operating areas using either a rectangular or arctic map.

- An availability level.

- The season and time interval to use for the analysis.

- A power schedule to use with a transmitter.
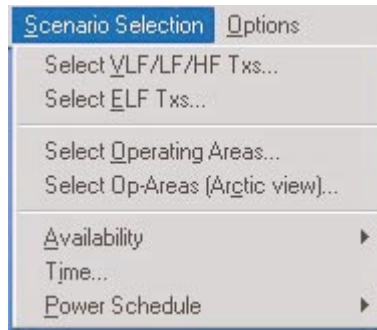
Figure 4. Scenario Selection menu screen.

4.3.1 Select VLF/LF/HF Txs

The *Select VLF/LF/HF Txs*... submenu item is used to select one or more VLF/LF/HF transmitters and one or more transmission modes for each selected transmitter. At least one transmitter must be selected to run an analysis. Section 5.1 discusses selecting a transmitter.

4.3.2 Select ELF Txs

The *Select ELF Txs*... submenu item is used to select an ELF transmitter and its associate probability level and message mark interval. Section 5.1 discusses selecting a ELF transmitter.

4.3.3 Select Operating Areas

The *Select Operating Areas*... submenu item is used to select one or more receiver locations and/or operating areas. At least one receiver location or operating area must be selected to run an analysis. Section 5.2 discusses selecting receiver locations and operating areas.

4.3.4 Select Op-Areas (Arctic View)

The *Select Op-Areas (Arctic View)*... submenu item is used to select one or more receiver locations and/or operating areas using the arctic polar map. Section 5.3 discdusses selecting receiver locations and operating areas using an arctic map.

4.3.5 Availability

The *Availability* submenu item is used to select an availability (confidence) level. An availability level must be selected to run an analysis; the default level is 90%. Section 5.4 discussses selecting an availability level.

4.3.6 Time

The *Time*... submenu item is used to select a season and a time interval for the analysis. A season and time interval must be selected to run an analysis; the defaults are Sep/Oct/Nov and 24 hours. Section 5.5 discusses selecting a season and a time interval.

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4.3.7 Power Schedule

The ***Power Schedule*** submenu defines or selects a power schedule to be used with a transmitter while performing a communications assessment. Section 5.6 discusses defining and selecting a power schedule.

4.4 OPTIONS

The ***Options*** menu item defines parameters for the Show Coverage scenario (figure 5). As described below, the ***Options*** menu contains the following submenus:

4.4.1 Coverage Chart

This submenu includes selecting the type of map to use (no map, a solid land mass map, a coastal outline map, or a ground conductivity map), the type of projection to use when displaying the map (rectangular, gnomonic, orthographic, or azimuthal equidistant), the type of day/night terminator display (no terminator, a line representation of the terminator, a solid filled night region, or both a solid fill and lines), and a Time Delay parameter that sets the minimum time in which the program will display the current coverage chart (values range from 0.1 to 5.0 seconds).

4.4.1.1 Map Projection. This submenu item (found under the Options/Coverage Chart menu item) selects the type of projection used in the Show Coverage analysis. The available projection types are rectangular (default), gnomonic, azimuthal equidistant, and orthographic.

4.4.1.2 Map Type. This submenu item (found under the Options/Coverage Chart menu item) is used to select the type of map displayed. The user must select a map to run the Show Coverage analysis. The available map types are no map, land map (default), coastal outline map, and ground conductivity map.

4.4.1.3 Terminator Display. This submenu item (found under the Options/Coverage Chart menu item) is used to select the type of day/night terminator display used in the coverage analysis. The available selections are no terminator is displayed, a set of lines showing the terminator, an overlay showing the nighttime portion of the selected map display, or a combination of lines and nighttime overlay is displayed.

4.4.1.4 Time Delay. This submenu item (found under the Options/Coverage Chart menu item) selects the minimum time that shall pass before the next coverage chart picture is displayed. The time delay can vary between 0.1 and 5.0 seconds.

4.4.2 Time Resolution

The ***Time Resolution*** submenu item allows the user to select the time resolution that determines the time interval for which coverage charts will be displayed. The time resolution ranges from every 30 minutes to every 6 hours.

4.4.3 HF Sunspot Level

This HF Sunspot Level submenu allows the user to select the desired sunspot level when analyzing HF coverage predictions. The sunspot levels are low (0 to 40), medium (40 to 80) and high (over 80).

4.4.4 Classification

This ***Classification*** submenu displays a classification level on NCAT displays. The available classification levels are None, Unclassified, Confidential, Secret, and Top Secret.

4.4.5 Plot Label…

The ***Plot Label***... submenu item assigns a label to a plot for the Show Coverage analysis. The user may enter an alphanumeric character string (maximum 80 characters) from the keyboard to label the plot. This label appears at the bottom of each coverage chart printed by the program.

Figure 5. Options menu screen.

4.5 HELP

The Help menu item obtains online context-sensitive help. For more information on help, either select the Help menu item or refer to reference 2.a.

5. CREATING A SCENARIO FOR ANALYSIS

This section describes the user options available when creating an NCAT scenario.

5.1 SELECTING TRANSMITTERS

To select a set of VLF/LF/HF transmitters for analysis, select Scenario Selection -> Select VLF/LF/HF Txs. This starts the VLF/LF/HF Transmitter Selection Dialog (figure 6). This dialog allows the user to select from one to four transmitters. To select a transmitter, position the mouse pointer over the desired transmitter's name and double-click using the left mouse button. The selected transmitter appears in the "Selected Transmitters" list box located below the "Available Transmitters" list box.

To deselect a transmitter, position the mouse pointer over the transmitter in the "Selected Transmitters" list box and double-click on it with the left mouse button. The transmitter will be removed from the list of selected transmitters. When all the desired transmitters have been selected, press the Ok button to save the selections and dismiss the dialog. To dismiss the dialog without saving the selections, press the Cancel button. For online help with selecting a transmitter, press the Help button.
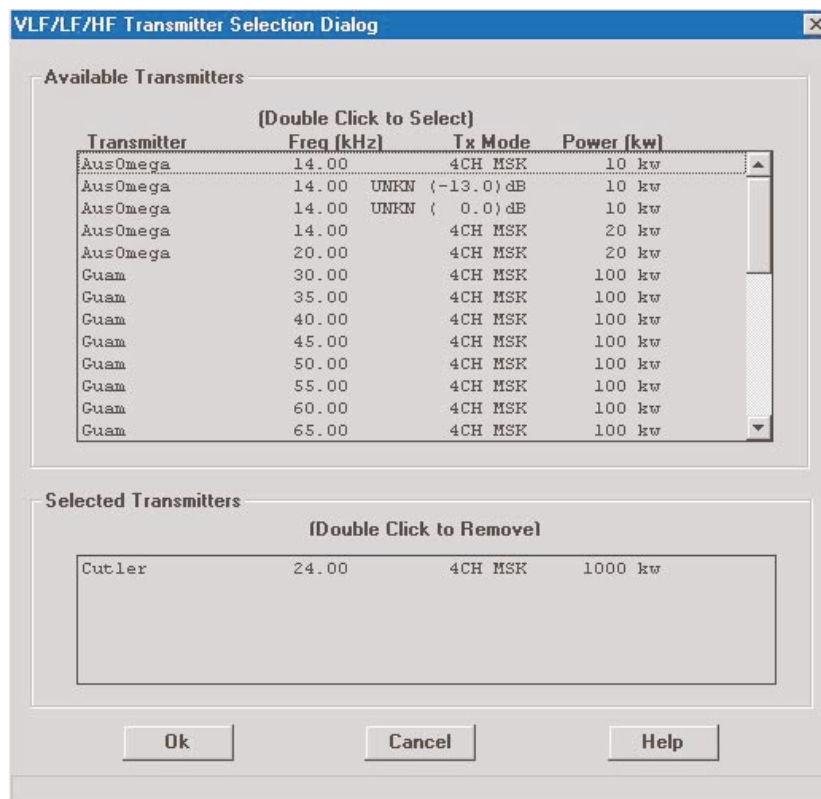

Figure 6. VLF/LF/HF Transmitter Selection Dialog.

If ELF data have been installed for NCAT, you may select an ELF transmitter for analysis. Select the Scenario Selection -> Select ELF Txs menu. This selection starts the ELF Transmitter Selection Dialog (figure 7). This dialog allows selection of a single ELF transmitter, a probability level, and the message mark interval. To select an ELF transmitter, position the mouse over the desired transmitter and click once with the left mouse button.

Figure 7. ELF Transmitter Selection Dialog.

5.2 SELECTING AN OPERATING AREA

To begin selection of an operating area, select Scenario Selection -> Select Operating Areas. This selection starts the Select Receiver/Operating Areas dialog (figure 8). This dialog allows the user to select 1 to 10 receiver/operating areas. NCAT uses only water areas in its analysis; thus signal and noise values over land masses enclosed by selected operating areas are not used when performing calculations.

The user uses the mouse to select rectangular operating areas. Position the mouse pointer at one corner of the desired operating area on the map; press and hold down the left mouse button while moving the mouse pointer to the opposite corner. While the mouse button is held down an outline box surrounds the selected area; a shaded rectangle represents the operating area when the button is released. The user may select up to 10 areas by repeating the above procedure. Figure 8 (area 0) shows an example of a selected operating area.

To select a single receiver point, position the mouse pointer over the desired location and press and then release the left mouse button without moving the mouse. A single receiver point will be selected (figure 8, area 1).
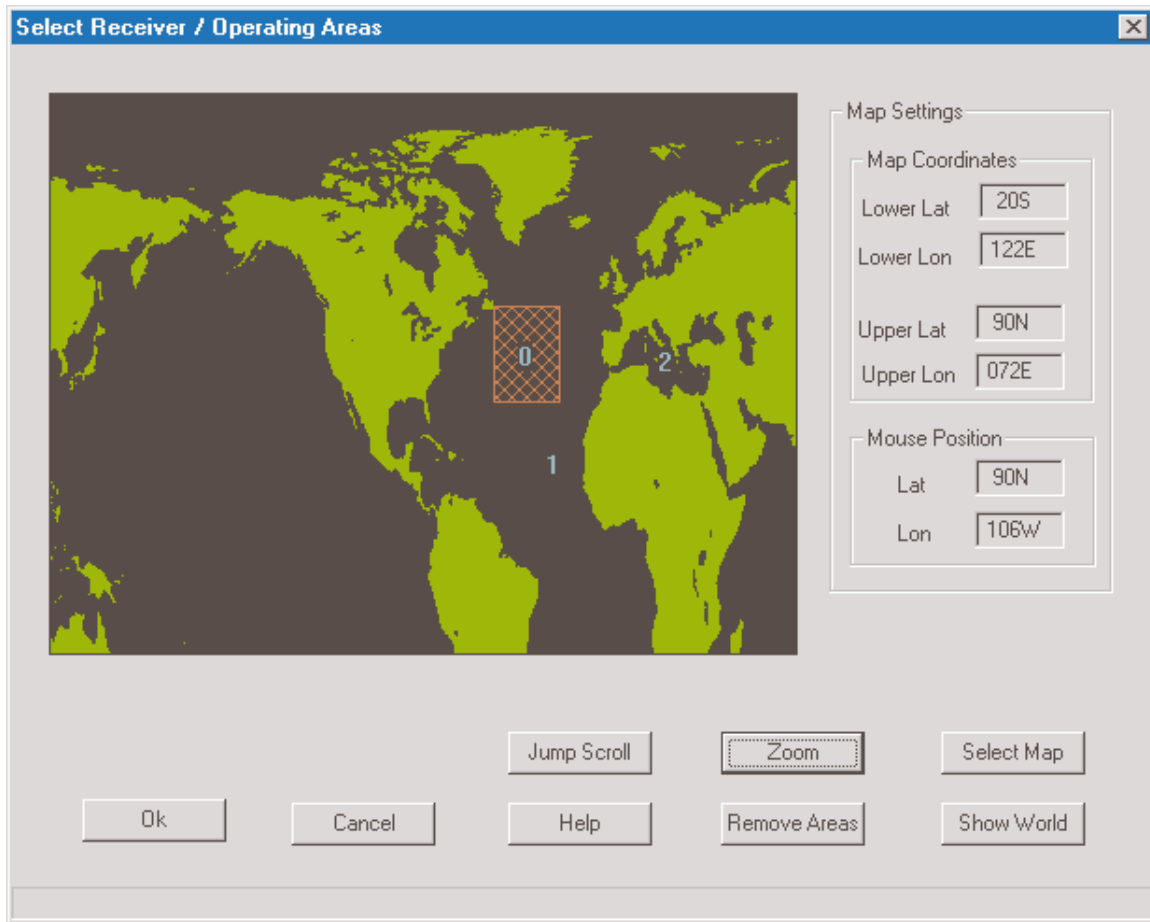
Figure 8. Select Receiver/Operating Areas dialog.

While the mouse pointer is over the displayed map, its current longitude and latitude are displayed to the right of the map (in the area labeled Mouse Position). The coordinates of the displayed map are also displayed to the right of the map (in the area labeled Map Settings). (A list of selected areas may be viewed in the Remove Areas dialog as described in section 5.2.4.) When the desired operating areas have been selected, select the Ok button to save the selections and dismiss the dialog. To dismiss the dialog without saving the selections, press the Cancel button. For online help with selecting an area, select the Help button.

While the default world map is useful for most area selections, sometimes the user might want a finer resolution map of a specific region. NCAT provides several methods to select a new map display. The user may zoom in on the most recently selected operating area, perform a jump scroll of the currently displayed map, or select a new map from a list of predefined maps. While selecting an operating area, the user may select the default world map by selecting the Show World button. The following subsections describe each available method of changing the default map.

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5.2.1 Zoom

The Zoom button enables the user to select any rectangular area on the displayed map and magnify this region. Zoom always operates on the last area selected. (The last area selected is the last entry in the listing of the Remove Areas dialog as described in section 5.2.4.)

An area must be selected (see section 5.2 for details) before a user can perform a zoom. When the user selects an area, the Zoom button enlarges the selected area, replacing the previously displayed map. The enlarged area is removed from the list of selected areas (which may be viewed in the Remove Areas dialog described in section 5.2.4). All other previously selected areas that fall within the zoomed area are shaded. From this new map view, the user may select an operating area

5.2.2 Select Map

The NCAT program provides a series of predefined maps. The user cannot modify this list of predefined areas. To view this list, select the Select Map button. This selection starts the Select a Map dialog (figure 9). To dismiss the dialog, select the Ok button. To dismiss the dialog without saving the selections, select the Cancel button. For online help with selecting a predefined map, select the Help button. To display a map from this list, double-click with the left mouse on the desired map.
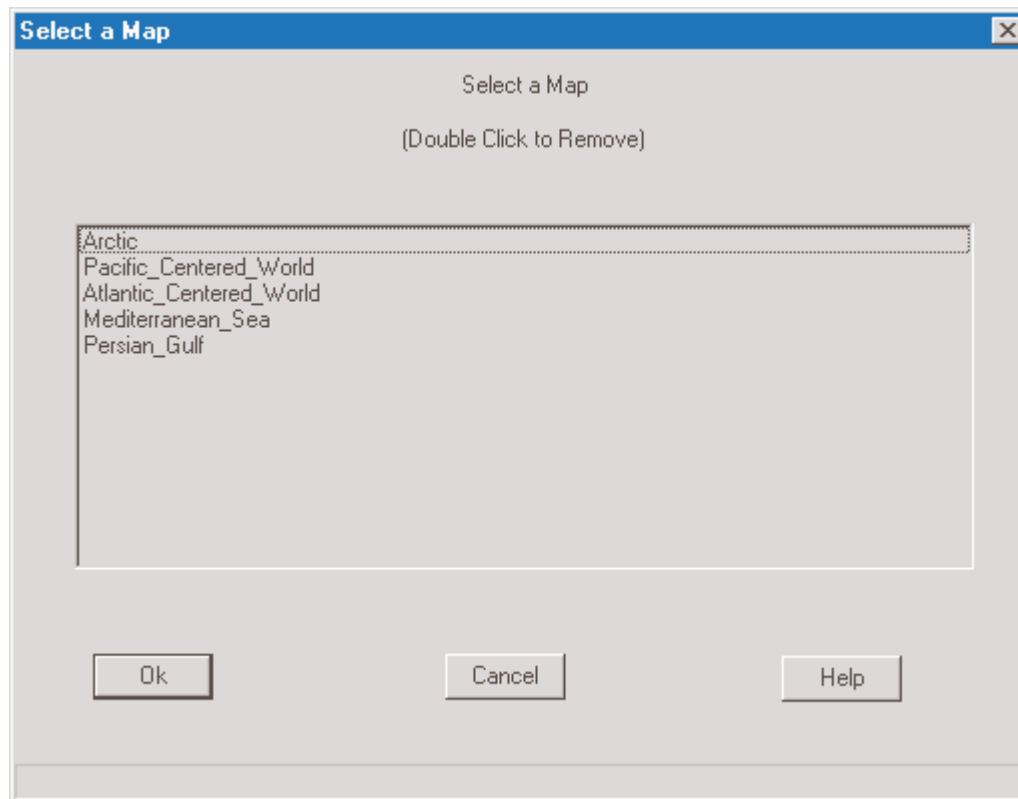

Figure 9. Select a Map dialog.

5.2.3 Jump Scroll

The Jump Scroll button allows the user to move the displayed map 20% to the left. The user must perform this action by selecting an operating area crossing longitudinal boundaries of the displayed map (i.e., if using the map in figure 7 you wish to select an area that starts at 70°E and goes to 90°E, you must scroll the displayed map to view this region and make it available for area selection).

5.2.4 Remove Areas

The Remove Areas button allows the user to remove a previously selected operating area or view the list of selected areas. The display shows a list of selected operating areas in the Remove Areas dialog (figure 10). Position the mouse pointer over the area to be removed and double-click with the left mouse button; the selected area will be deleted from the list. When all the desired areas are deleted, select the Ok button to save the changes and dismiss the dialog. To dismiss the dialog without saving the selections, select the Cancel button. For online help with removing an operating area, select the Help button.

5.2.5 Selecting a Center Point

When displaying coverage charts using the gnomonic, azimuthal, or orthographic projections, the user can specify a center point for the plot by selecting a single point on the Select Receiver/Operating Areas dialog (figure 8). This single point provides the MotionVLF display program (described in section 8.6) with the map's center. If a center point is not specified, NCAT determines the center point for these projections based on the middle of the currently displayed map in the Select Receiver/Operating Areas dialog. Specifying the center point is particularly important when the user desires an arctic plot. To select a center point at the pole, position the mouse pointer at the top of the map and press and release the left mouse button when the coordinates in the "mouse position lat" field reads 90°N and the desired center longitude is displayed.
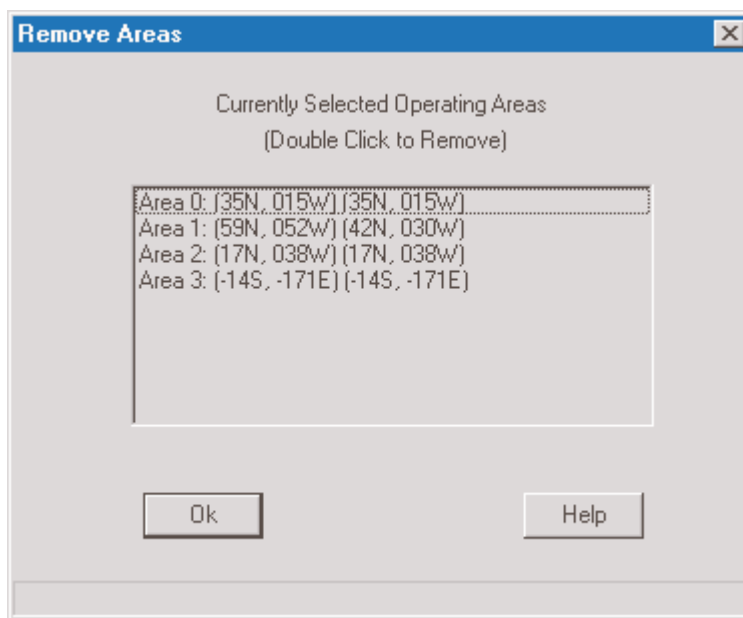

Figure 10. Remove Areas dialog.

5.3 SELECTING AN ARCTIC OPERATING AREA

To begin selection of an arctic operating area, select Scenario Selection ->Select Op-Areas (Arctic view…). This starts the Arctic Operating Area Selection dialog (figure 11). This dialog allows selection of 1 to 10 receiver/operating areas using an arctic view for the selection process. NCAT uses only water areas in its analysis; thus signal and noise values over land masses enclosed by selected operating areas are not used when performing calculations. Area selections and removals are performed as previously described in section 5.2.

To save your selections and dismiss this dialog, press the OK button. To exit from this dialog without saving the previous area selections, press the Cancel button. To obtain help with selecting an operating area using the arctic map, press the Help button.

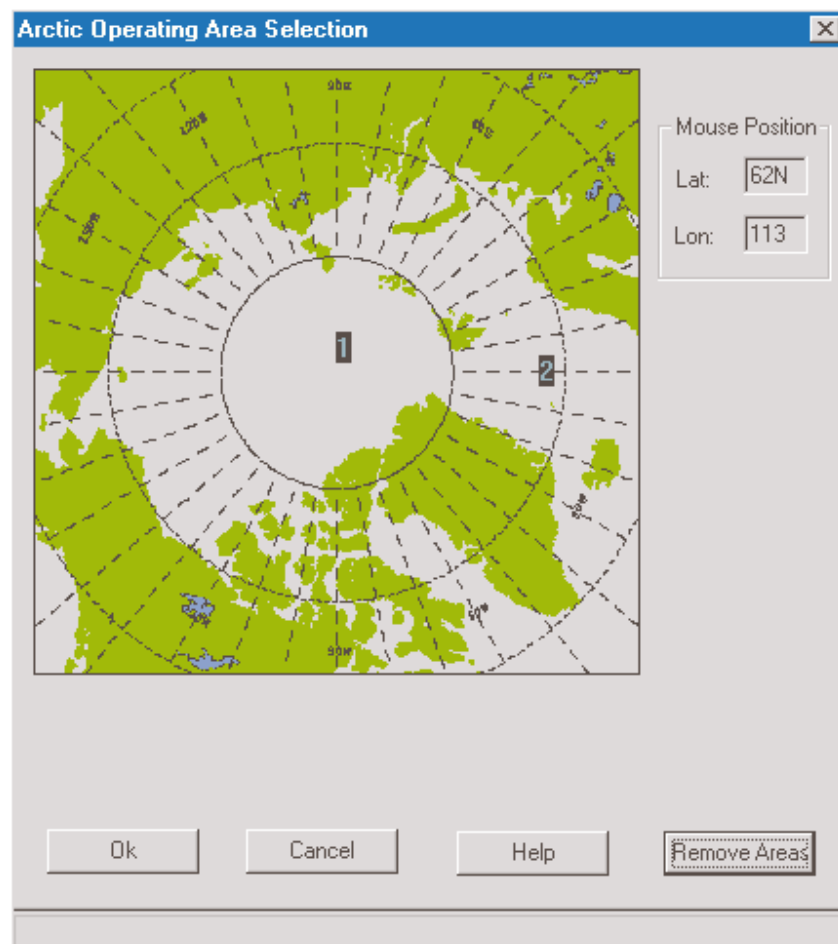
Figure 11. Arctic Operating Area Selection dialog.

5.4 SELECTING AN AVAILABILITY LEVEL

The availability level specifies a safety factor applied to the coverage predictions to allow for prediction uncertainties and naturally occurring variations in the observed signals. For example, an availability of 90% means that, in the long run, 90% of the field experience will be at least as good as

predicted, assuming the received SNR is essentially the same as that received by an omni-directional antenna at the ocean surface.

To select an availability level, select Scenario Selection -> Availability. This menu item allows the user to select a single availability level of 50%, 70%, 90% (default level), 99%, or define a level (from 1% to 99%). The selected availability level is used for all transmitter(s) and areas selected. A check mark is displayed next to the selected level (if the menu item is re-inspected).

To select a user-defined level, select Scenario Selection -> Availability -> User Specified.... This starts the Availability Levels dialog (figure 12). To select an availability level from this dialog, double-click on the desired availability level. This action selects the requested availability level and dismisses the dialog. The user may also single-click on the desired availability level and then press the Ok button to dismiss the dialog. To dismiss the dialog without saving the selection, select the Cancel button. For online help when selecting an availability level, select the Help button.
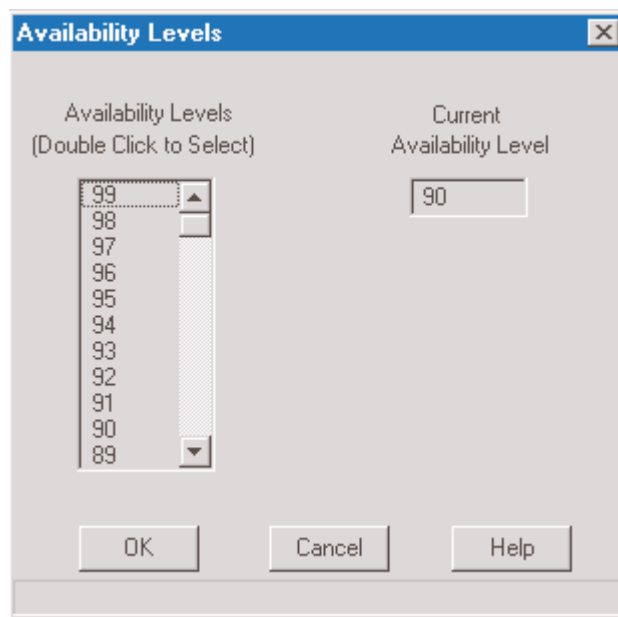

Figure 12. Availability Levels dialog.

5.5 SELECTING A SEASON AND TIME

The NCAT program uses a four-season database that consists of Sep/Oct/Nov, Dec/Jan/Feb, Mar/Apr/May, and Jun/Jul/Aug periods. NCAT defaults to performing a 24-hour analysis.

To select a season/time, select Scenario Selection -> Time... This starts the Select Season and Time dialog (figure 13). This dialog allows the user to select a single season and a single time range for analysis. Select a season using the mouse button; this action highlights the selected season's radio button. To select a specific time interval for analysis, select the Specific Time Interval radio button. Select a start time and a stop time (start time must be less than stop time) by selecting the up and down arrows until the desired time interval is displayed in each window. To save the selections and

dismiss the dialog, select the Ok button. To dismiss the dialog without saving the selection, select the Cancel button. For online help in selecting a season and a time, select the Help button.
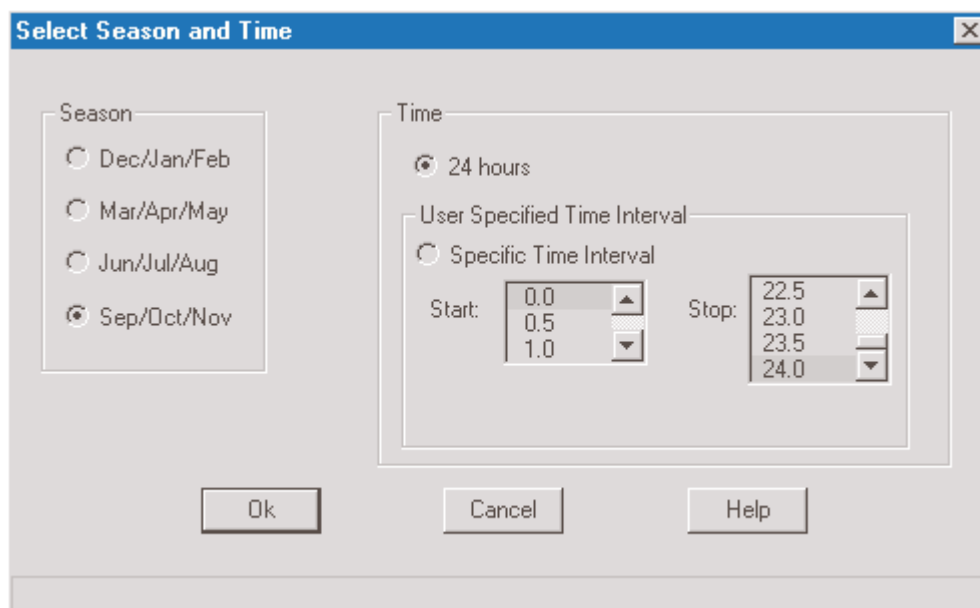

Figure 13. Select Season and Time dialog.

5.6 SELECTING A POWER SCHEDULE

To select a power schedule, select <u>S</u>cenario Selection -> <u>P</u>ower Schedule. A series of three submenu items appear: Define a Power Schedule, Select Power Schedule, and Review Power Schedule. These menu items allow the user to define power schedules, select a power schedule/transmitter pair, and review the previously selected transmitter/power schedule associations.

5.6.1 Defining a Power Schedule

To create a power schedule, select the <u>S</u>cenario Selection -> <u>P</u>ower Schedule -> <u>D</u>efine a Power Schedule menu item. This action displays the Define a Power Schedule dialog (figure 14). The Currently Defined power schedules list box lists previously defined power schedules. The Selected Power Schedule Name field displays the currently selected power schedule's file name. The Power Schedule field displays the values of the selected power schedule. To change the name of the displayed power schedule, edit the contents of the Name: field. To change the currently displayed power schedule, edit the contents of the Power Schedule field. The power schedule must be entered in the following format (at least one line must be present in the file and an entry can be made for every 30-minute time interval, if desired):

     start_time   stop_time   power_level

     start_time   stop_time   power_level

     start_time   stop_time   power_level

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The user should use 30-minute time intervals (i.e., if the previous stop time was 1200, the next start time should be 1230) to specify the start and stop times. NCAT does not perform error checking on the input power schedule; thus, it is important for the user to follow these guidelines to correctly enter the power schedule.

To save a power schedule, select the Save button. To dismiss this dialog without saving any changes, select the Ok button. For online help with defining a power schedule, select the Help button.
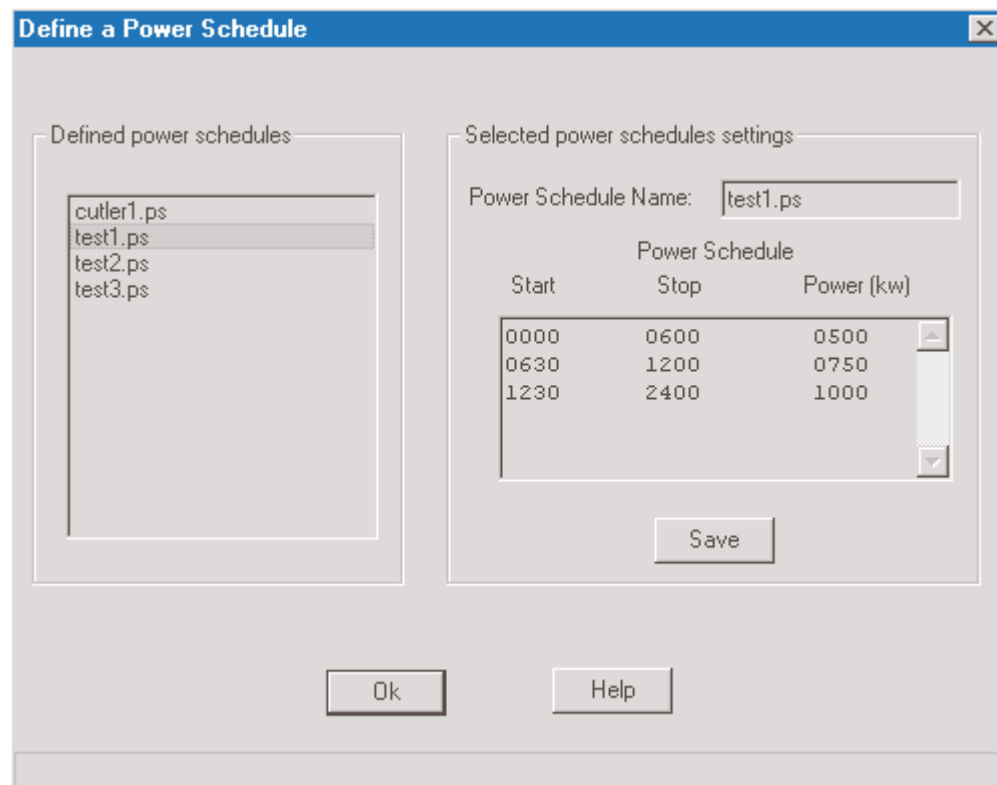

Figure 14. Define a Power Schedule dialog.

5.6.2 Associating a Power Schedule with a Transmitter

To use a power schedule after it was defined, it must be associated with one of the previously selected transmitters. To associate a transmitter with a power schedule, select the Scenario Selection -> Power Schedule -> Select Power Schedule menu item. This displays the Associate a Power Schedule with a Transmitter dialog (figure 15). The Available Power Schedules list box displays all previously defined power schedules. The Selected Transmitters list box displays all previously selected transmitters. To associate a power schedule with a transmitter, select a power schedule and a transmitter from their respective lists and select the Associate button. This selection associates the selected power schedule and the transmitter. The selected power schedule will be used for communications assessment requests that involve the transmitter.

To review previous associations, select the Review Associations button. This selection displays the Review/Remove Power schedule associations dialog (figure 16). To dismiss this dialog, select the Ok button. For online help with associating a power schedule to a transmitter, select the Help button.
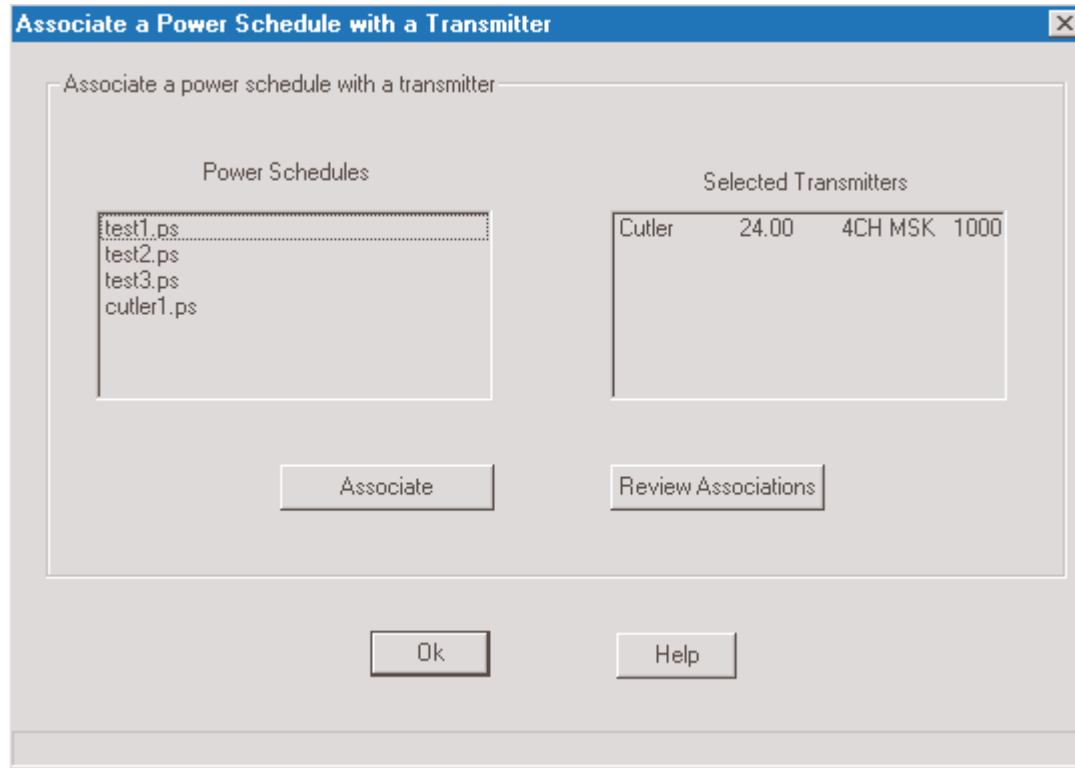

Figure 15. Associate a Power Schedule with a Transmitter dialog.

5.6.3 Reviewing or Removing Power Schedule Associations

To review or remove a power schedule/transmitter association, select the Scenario Selection -> Power Schedule -> Review Power Schedules menu item. This selection displays the Review/Remove Power schedule associations dialog (figure 16). To remove an association, position the mouse pointer over the desired power schedule/transmitter pair and double-click using the left mouse button. The selected association will be removed from the list of associations. To dismiss this dialog, select the Ok button. For online help with reviewing/removing a power schedule/transmitter association, select the Help button.
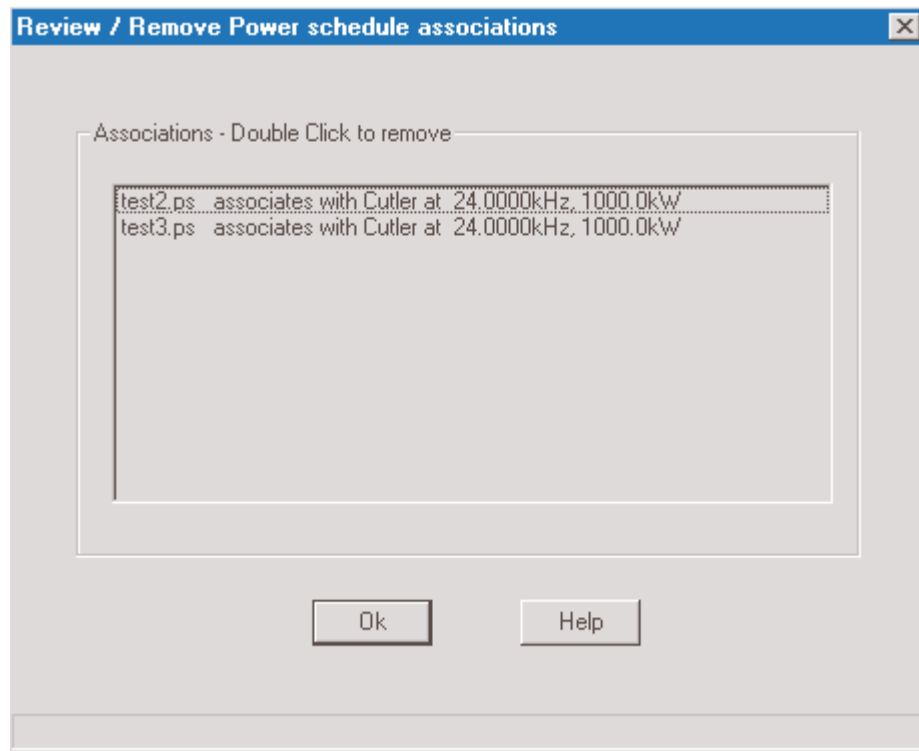
Figure 16. Review/Remove Power schedule associations dialog.

6. RUNNING A SCENARIO

When all desired selections are completed (see section 5), including the required selections of at least one transmitter and one receiver area, the user may conduct a coverage area assessment. NCAT provides various analyses including the following:

- A determination of the percentage of full power for each of the selected transmitter(s) that is required to fully cover the combined selected receiver area(s). To perform a Percentage of Power analysis, select Run Scenario -> Show Percent Power.... Figure 17 shows an example of the resulting hard copy.

- A plot of the minimum SNR of the combined selected areas for each of the selected transmitter(s). To perform an SNR analysis, select Run Scenario -> Show SNR.... Figure 18 shows an example of the resulting hard copy.

- A determination of the minimum power, in kW, required to be output by each of the transmitter(s) to fully cover the combined selected receiver area(s). To perform a Minimum Power analysis, select Run Scenario -> Show Power Levels.... Figure 19 shows an example of the resulting hard copy.

- A time availability plot that shows copy/no copy periods for the selected transmitter operating area pairs. To perform a Time Availability plot, select Run Scenario -> Show Time Availability.... Figure 20 shows an example of the resulting hard copy.

- A minimum composite SNR plot of the selected operating areas and transmitters selected. To perform a minimum composite plot, select Run Scenario -> Show SNR Composite (MIN)... Figure 21 shows an example of a minimum composite SNR chart.

- A maximum composite SNR plot of the selected operating areas and transmitters selected. To perform a maximum composite plot, select Run Scenario -> Show SNR Composite (MAX)... Figure 22 shows an example of a maximum composite SNR chart.

- A composite SNR plot of the selected operating areas and transmitters selected. To perform a composite plot, select Run Scenario-> Show SNR Composite… Figure 23 shows an example of a composite SNR chart.

- A series of coverage charts for a selected transmitter (using the last map area selected). The user may select various options (described in section 4.4). To view the selected series of coverage charts, select Run Scenario -> Show Single Coverage... or Run Scenario -> Show Joint Coverage.... Section 8.6 describes controls for viewing the coverage charts. Figure 24 shows an example of the resulting hard copy.

- An hours of copy coverage chart that summarizes the number of hours that the selected transmitter covers an area. To view an Hours of Copy coverage chart, select Run Scenario->Show HofC. Figure 25 shows an example of the resulting hard copy.

While NCAT processes the requested data, the NCAT main menu window displays a status summary. This display shows the frequency and hour for the data file currently processed. When all the required data files are processed, the display shows the resulting histogram or chart. (Note: the operator may not halt an analysis started by the Run Scenario menu during processing.)

On the screen, the histograms are color-coded as follows:

- Green: the transmitter can cover the selected area(s).

- Red: the transmitter cannot cover the selected area(s) at its current maximum radiated power level and transmission mode.
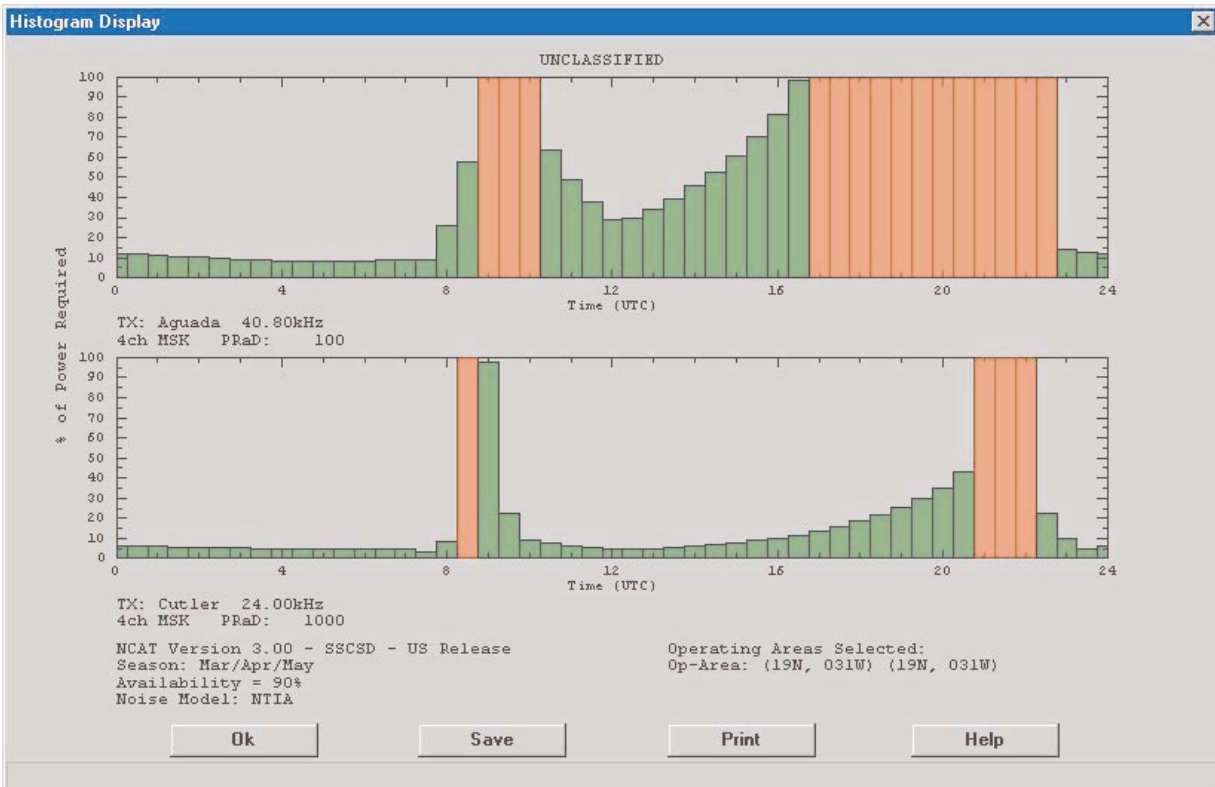

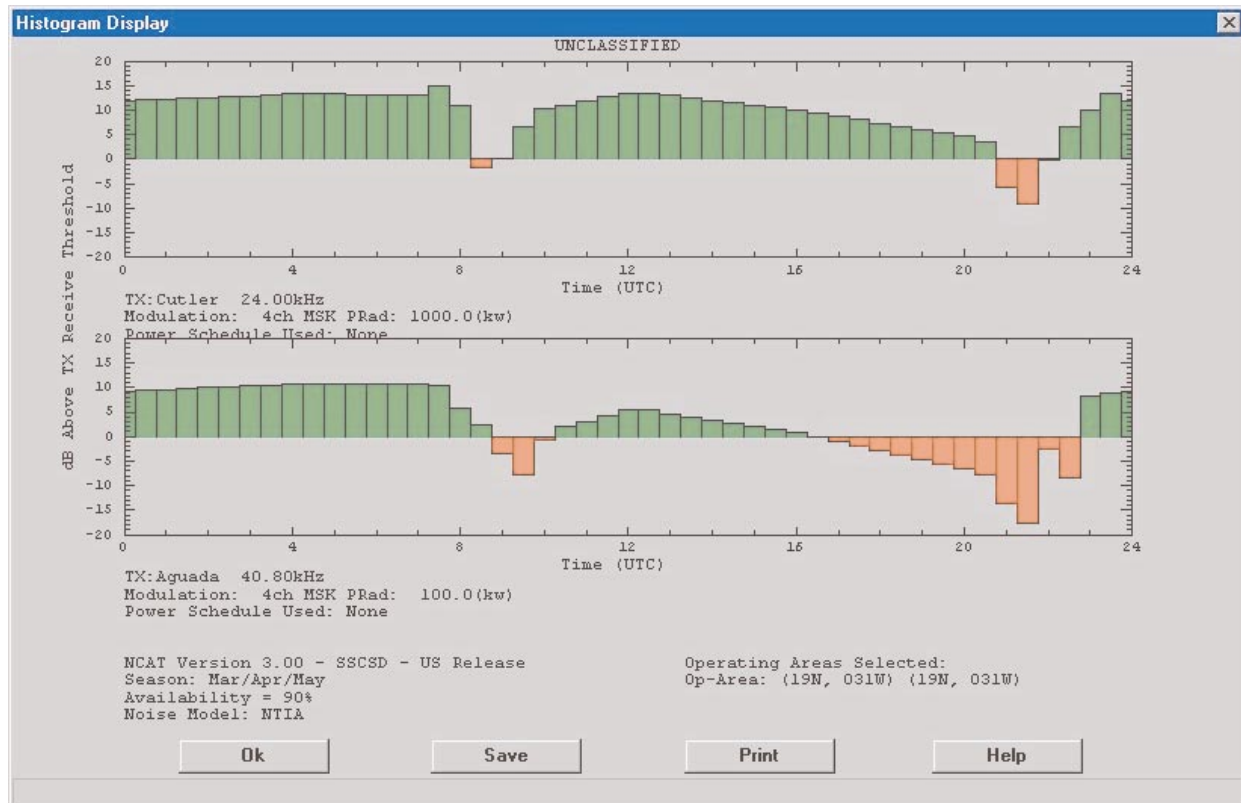Figure 17. Example of a percentage of power histogram.

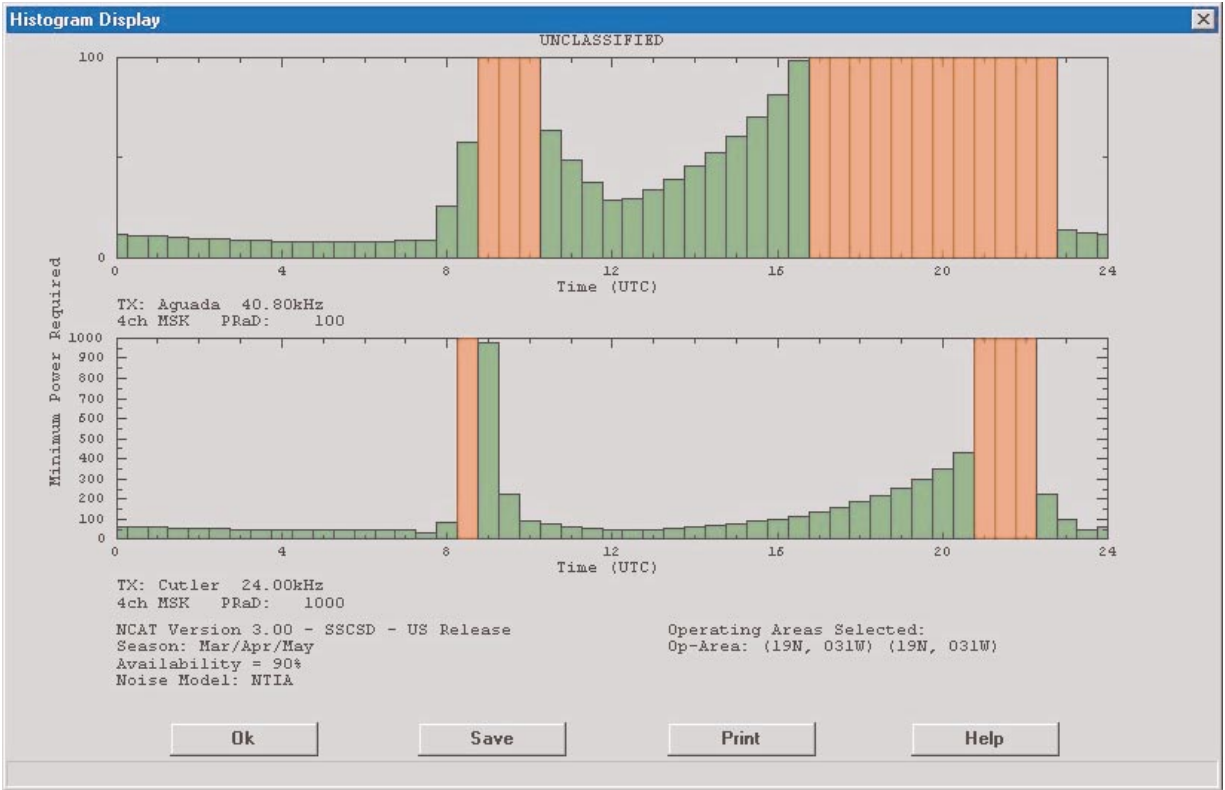Figure 18. Example of an SNR histogram.

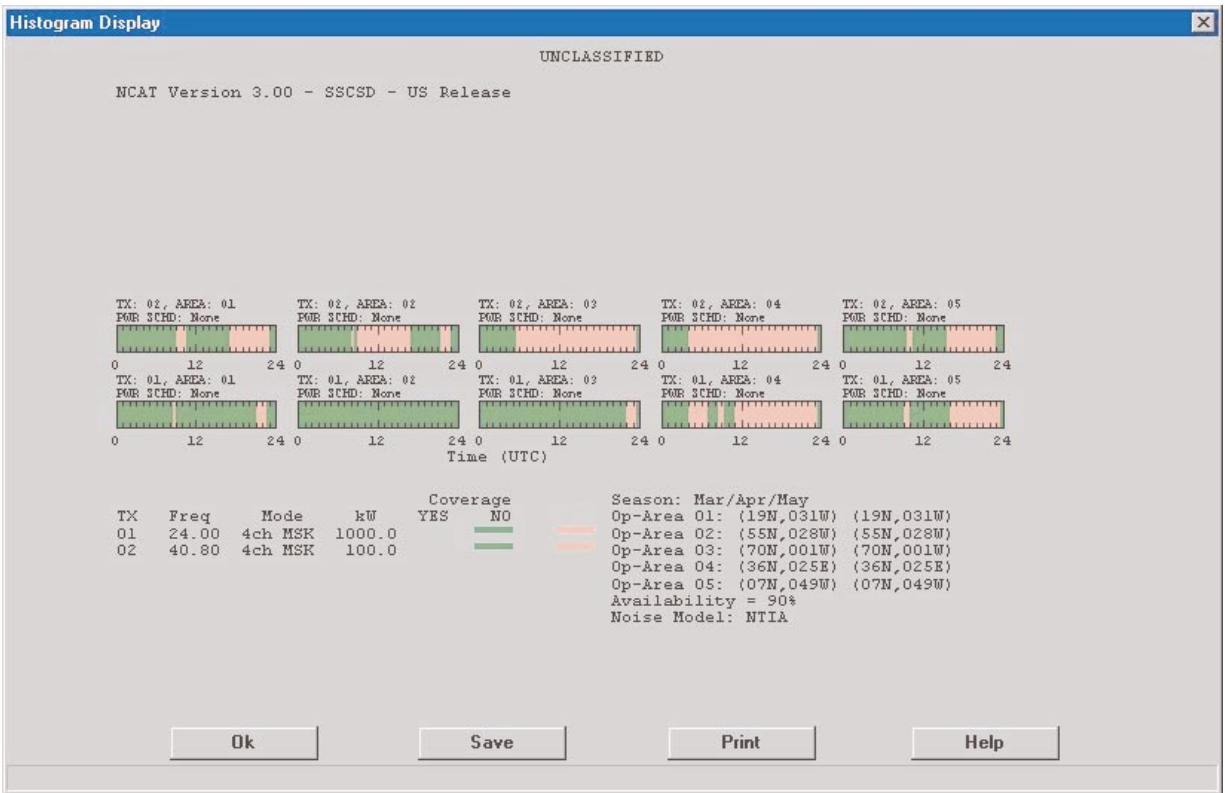Figure 19. Example of a power level histogram.

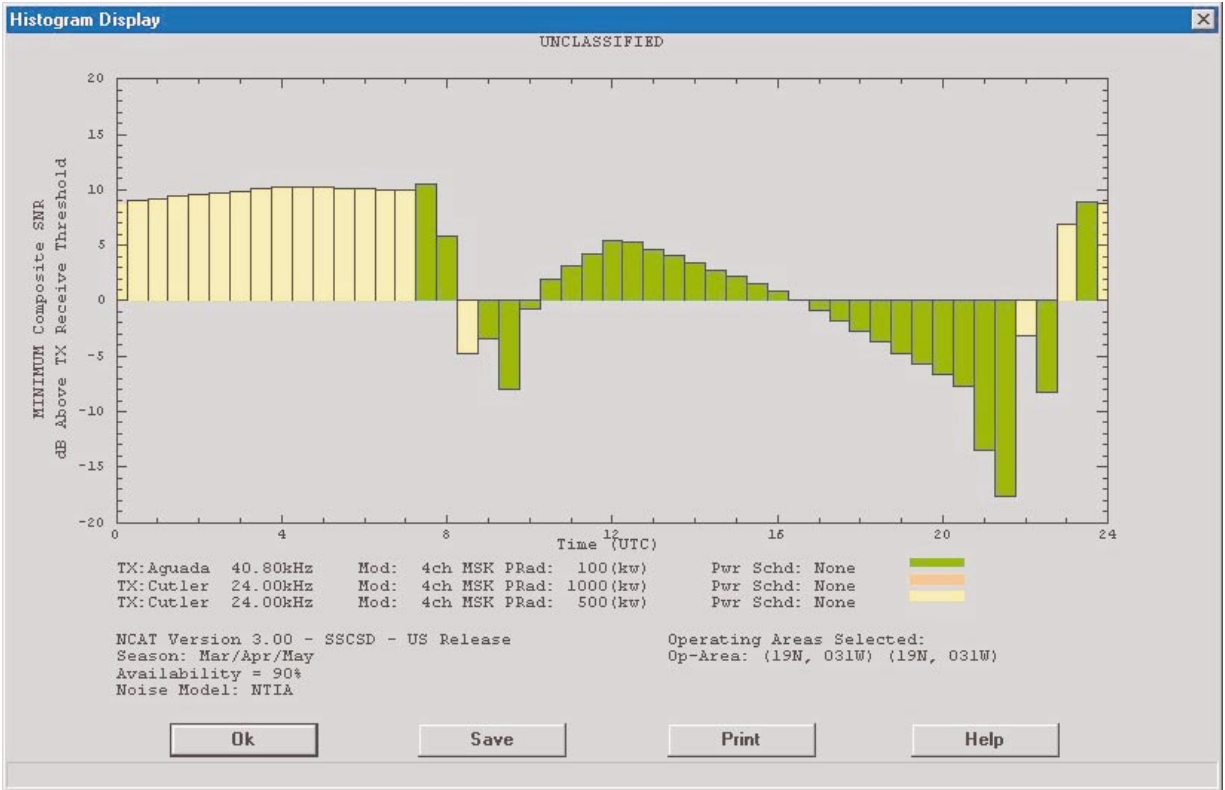Figure 20. Example of a time availability plot.
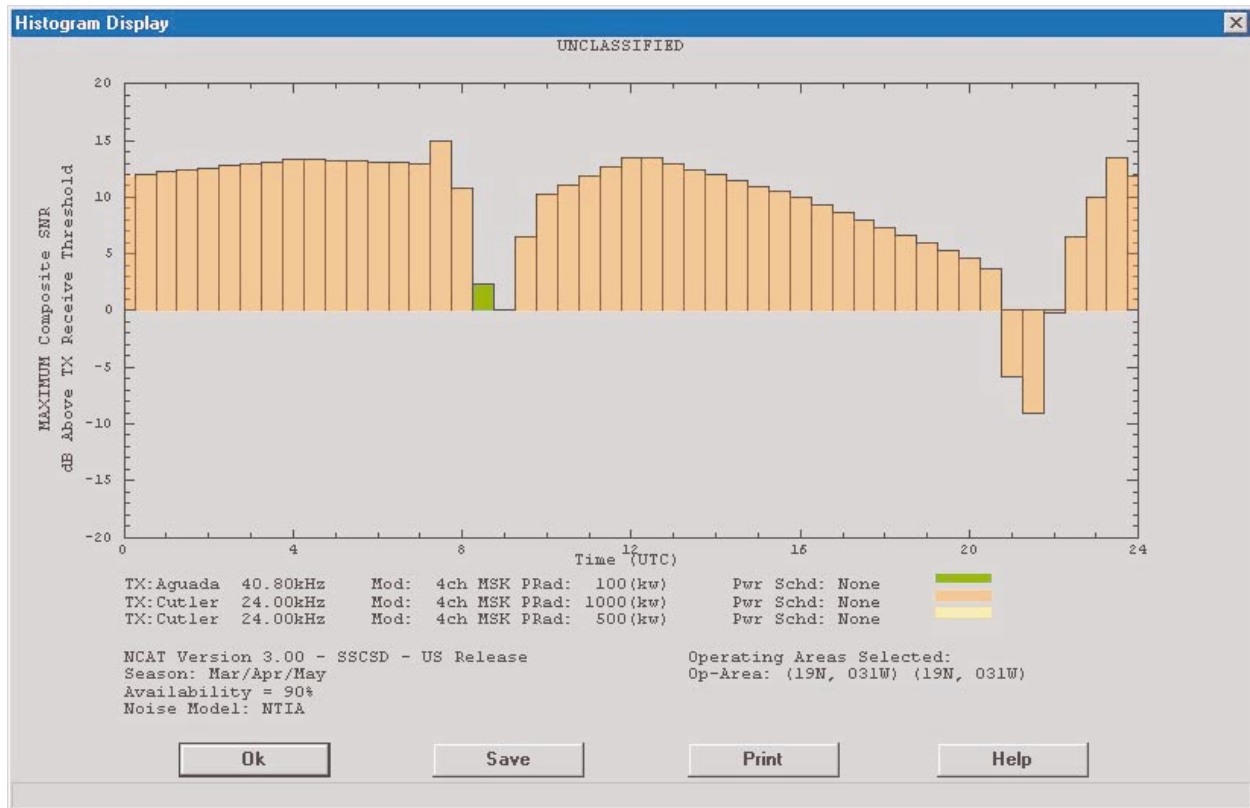
Figure 21. Example of a minimum composite SNR plot.

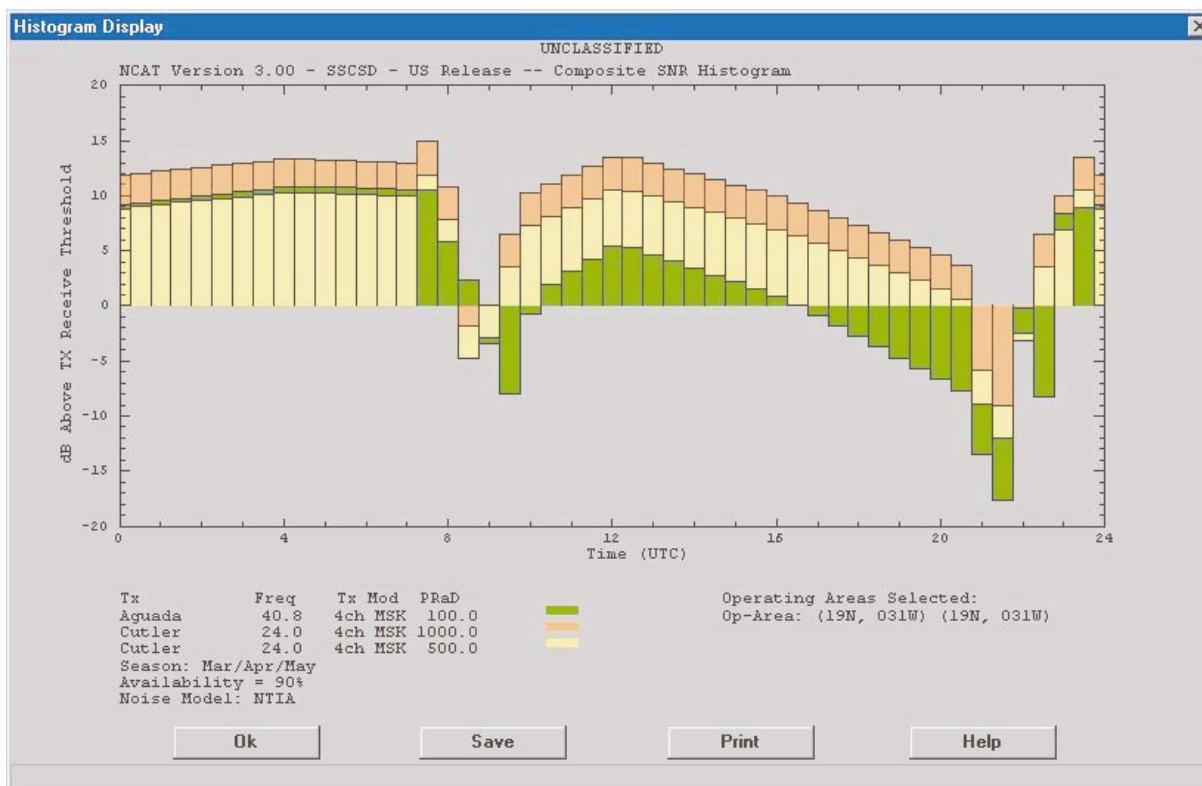Figure 22. Example of a maximum composite SNR plot.
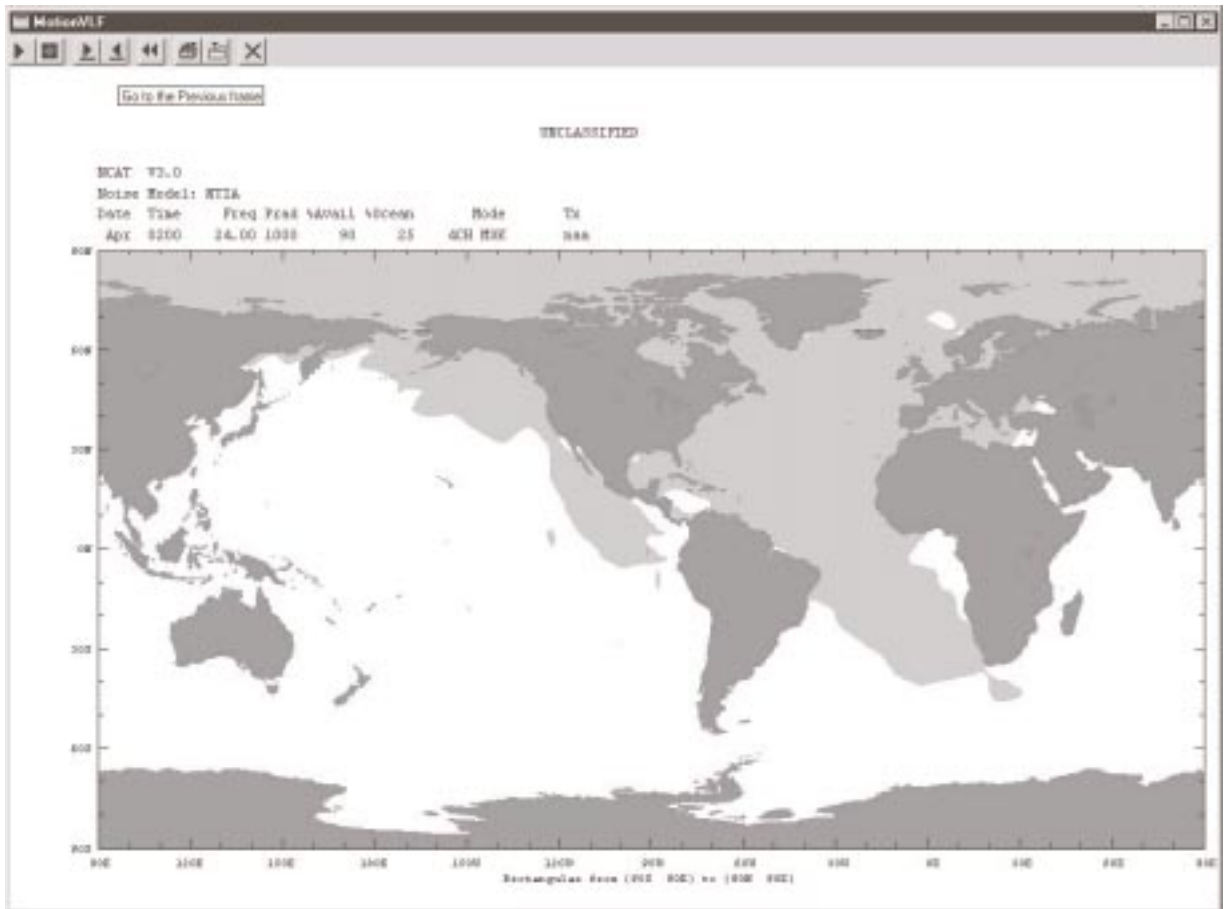
Figure 23. Example of a composite SNR chart.
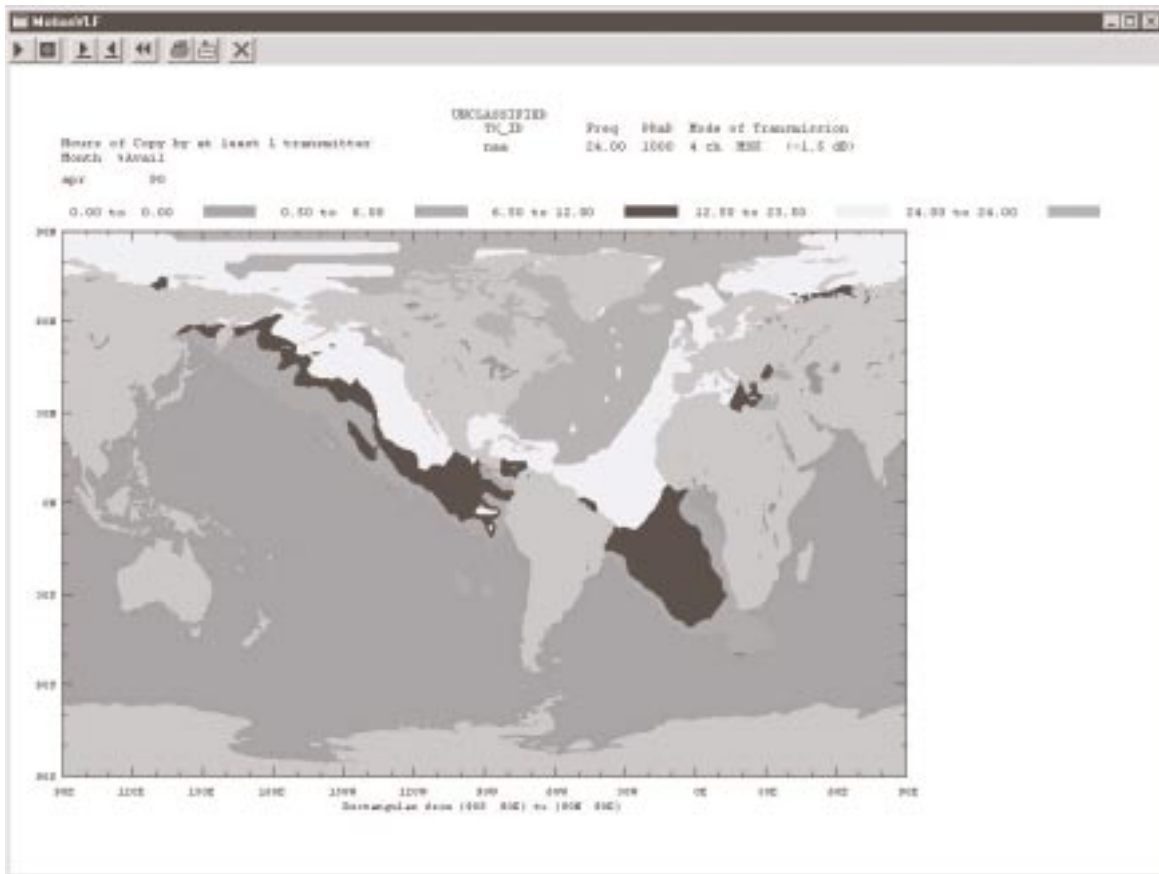
Figure 24. Example of coverage chart.

Figure 25. Example of an hours of copy coverage chart.

7. MODIFYING A VLF/LF/HF TRANSMITTER'S CHARACTERISTICS

The user may modify two VLF/LF/HF transmitter characteristics:

- The transmitter's default radiated power level.

- The transmitter's default transmission mode (Frequency Shift Keying [FSK], two-channel Minimum Shift Keying [MSK], four-channel MSK, Submarine Low Frequency VME bus Receiver [SLVR], and Range Extension Mode [REM]). The transmission mode effectively sets the threshold of the receiver used to receive the transmitted signal.

For NCAT, the transmitter's maximum radiated power level is predefined as the standard radiated power. However, because standard radiated power may change, NCAT allows the user to change a transmitter's maximum radiated power level (and its transmission mode). To change a transmitter's maximum power or transmission mode, select File -> Modify Tx Data... from the NCAT main menu. This will initiate the Modify Transmitter Data dialog (figure 26).

To modify a transmitter's characteristics, perform the following steps:

- Select a transmitter from the Available Transmitters list box. The Selected Transmitter Settings group box displays the selected transmitter's default modulation and maximum power level.

- To modify the transmitter's mode, click on the desired modulation (2 ch MSK, 4 ch MSK, FSK, 2 ch SLVR, or REM). To use a nonstandard value, click on the "Other" radio button and enter in the desired SNR in dB.

- To change the transmitter's maximum radiated power level, select a new power level from the Maximum Power list box by either single- or double-clicking on the desired new maximum power level, using the up and down arrows to scroll through the possible power levels.

- When the new power and/or modulation for the transmitter are selected, select the Save Changes button to save the changes or the Add as New button to create a new transmitter entry.

To change the characteristics for another transmitter, select another transmitter from the Available Transmitters list box and repeat the above steps.

When all desired changes are made, select the Ok button to dismiss the dialog and return to the NCAT main menu. To dismiss the dialog without saving changes made after selecting the Save Changes button, select the Cancel button. To obtain online help, select the Help button.

Figure 26. Modify Transmitter Data dialog.

8. EXAMPLES

This section provides NCAT program examples. Perform these examples in the order given to eliminate repetition of steps.

1. Perform default mode, single-area, percentage of power analysis for a single transmitter.

2. Add another area selection and select multiple transmission modes for a minimum power analysis.

3. Deselect multiple transmission modes and change the default availability level to 50% for an SNR analysis.

4. Select a user-specified availability level for a percentage of power analysis.

5. Select a season and time interval and remove an operating area for a time availability analysis.

6. View coverage charts for a single transmitter.

8.1 SINGLE-TRANSMITTER ANALYSIS

This example shows how to use the NCAT program with defaults for all settings except the selected transmitter and operating area. This example is the basis for all of the other examples in this section. To perform a basic analysis, perform the following steps.

8.1.1 Starting NCAT

To start the NCAT program, either type NCAT from a Command Prompt window or double-click on the NCAT program icon.

8.1.2 Selecting a Transmitter

To select a transmitter, perform the following steps:

1. Select the Scenario Selection menu item to display the submenu items.

2. Select the Select VLF/LF/HF Txs…submenu item to display the Select VLF/LF/HF Transmitter Selection dialog.

3. Select the first transmitter in the list by clicking on the transmitter's name (e.g., Cutler).

4. Select the Ok button to dismiss the Select VLF/LF/HF Transmitter Selection dialog and redisplay the NCAT main menu.

8.1.3 Selecting an Operating Area

To select an operating area, perform the following steps:

1. Select the Scenario Selection menu item to display the submenu items.

2. Select the Select Operating Areas... submenu item to display the Select Receiver/Operating Areas dialog (figure 8).

3. Position the mouse pointer at one corner of the desired operating area on the map; draw a small box by pressing and holding down the left mouse button while moving the pointer to the

opposite corner. While the mouse button is held down, an outline box surrounds the selected area; when the button is released, a shaded rectangle represents the operating area.

4. Select the Ok button to dismiss the Select Receiver/Operating Areas dialog and redisplay the NCAT main menu.

8.1.4 Generating the Percentage of Power Analysis

To generate the percentage of power analysis, perform the following steps:

1. Select the Run Scenario menu item to display the submenu items.

2. Select the Show Percent Power... submenu item to generate the percentage of power histogram.

8.2 STANDARD AVAILABILITY LEVELS

This example shows how to select from one of the three standard availability levels (50%, 90%, or 99%).

8.2.1 Selecting a Transmitter

To select only one transmission mode, perform the following steps:

1. Select the Scenario Selection menu item to display the submenu items.

2. Select the Select VLF/LF/HF Txs… submenu item to display the VLF/LF/HF Transmitter Selection dialog (figure 6).

3. Select the Ok button to dismiss the VLF/LF/HF Transmitter Selection dialog and redisplay the NCAT main menu.

8.2.2 Selecting a Standard Availability Level

To select one of the standard availability levels, perform the following steps:

1. Select the Scenario Selection menu item to display the submenu items.

2. Select the Availability submenu item to display the submenu items.

3. Select the 50% submenu item. That item will get a check mark next to it, and the NCAT main menu will be redisplayed.

8.2.3 Generating the SNR Analysis

To generate the SNR analysis, perform the following steps:

1. Select the Run Scenario menu item to display the submenu items.

2. Select the Show SNR submenu item to begin generation of the SNR histogram.

8.3 USER-SPECIFIED AVAILABILITY LEVEL

This example shows how to select a user-specified availability level.

8.3.1 Selecting a User-Specified Availability Level

To select a user-specified availability level, perform the following steps:

1. Select the Scenario Selection menu item to display the submenu items.

2. Select the Availability submenu item to display the submenu items.

3. Select the User Specified... submenu item to display the Availability Levels dialog (figure 12).

4. The Availability Levels list box will display a list of all possible availability values. Double-click on one of the availability levels. The Current Availability Level displays the value, the dialog is dismissed, and the NCAT main menu redisplays.

8.3.2 Generating the Percentage of Power Analysis

To generate the percentage of power analysis, perform the following steps:

1. Select the Run Scenario menu item to display the submenu items.

2. Select the Show Percent Power... submenu item to generate the percentage of power histogram.

8.4 TIME INTERVAL

This example shows how to select a time interval for analysis (the default is for NCAT to perform a 24-hour analysis).

8.4.1 Selecting a Time Interval

To select a time interval, perform the following steps:

1. Select the Scenario Selection menu item to display the submenu items.

2. Select the Time... menu item to display the Select Season and Time dialog (figure).

3. Select the Specific Time Interval radio button. The 24 Hours button will be cleared and the Specific Time Interval button darkens, indicating selection.

4. Use the up and down arrow buttons to the right of the Start: window to select a starting time. The time displays in the Start: window. Perform the same process for the stop time. (Note: stop time must be greater than start time.)

5. Select the Ok button to dismiss the Select Season and Time dialog and redisplay the NCAT main menu.

8.4.2 Removing an Operating Area

To remove an operating area, perform the following steps:

1. Select the Scenario Selection menu item to display the submenu items.

2. Select the Select Operating Area... submenu item to display the Select Receiver/Operating Areas dialog (figure 8).

3. Select the Remove Areas button to display the Remove Areas dialog (figure 10).

4. Double-click on the first two areas in the list. Those areas are deleted from the list and only the last area selected displays.

5. Select the Ok button to save the changes, dismiss the Remove a Selected Operating Area dialog and redisplay the NCAT main menu.

8.4.3 Generating the Time Availability Analysis

To generate the time availability analysis, perform the following steps:

1. Select the Run Scenario menu item to display the submenu items.

2. Select the Show Time Availability... submenu item to generate of the time availability plots.

8.5 GENERATING A COVERAGE CHART

To generate coverage charts, select from one to four transmitters. The program uses the currently selected mapping area (see selecting operating areas) as its display map. The parameters for viewing the coverage charts may be changed using the Options menu (see section 4.4).

1. Select the Run Scenario menu item.

2. If only one transmitter was selected, select the Show Single Coverage... submenu item to view coverage charts. If more than one transmitter was selected, select the Show Joint Coverage menu item to view coverage charts. The Coverage Chart viewer, Motion VLF appears.

A user can use the Motion VLF viewer to view the selected coverage charts. The viewer has functions similar to a video player. Figure 27 shows the Motion VLF screen. The following functions are provided:

Play - Begins showing coverage charts from the current position.

Stop - Halts the display of the coverage charts.

Single Frame Reverse - Displays one frame previous to the current display.

Single Frame Forward - Displays the next time interval from the current display.

Rewind - Resets the coverage charts to the first one requested.

Print - Prints the currently displayed coverage chart.

Save - Saves the currently selected coverage chart in the Hewlett Packard Graphics
Language (HPGL) file format.

Exit - Exits from the coverage chart viewer program and returns to the NCAT main
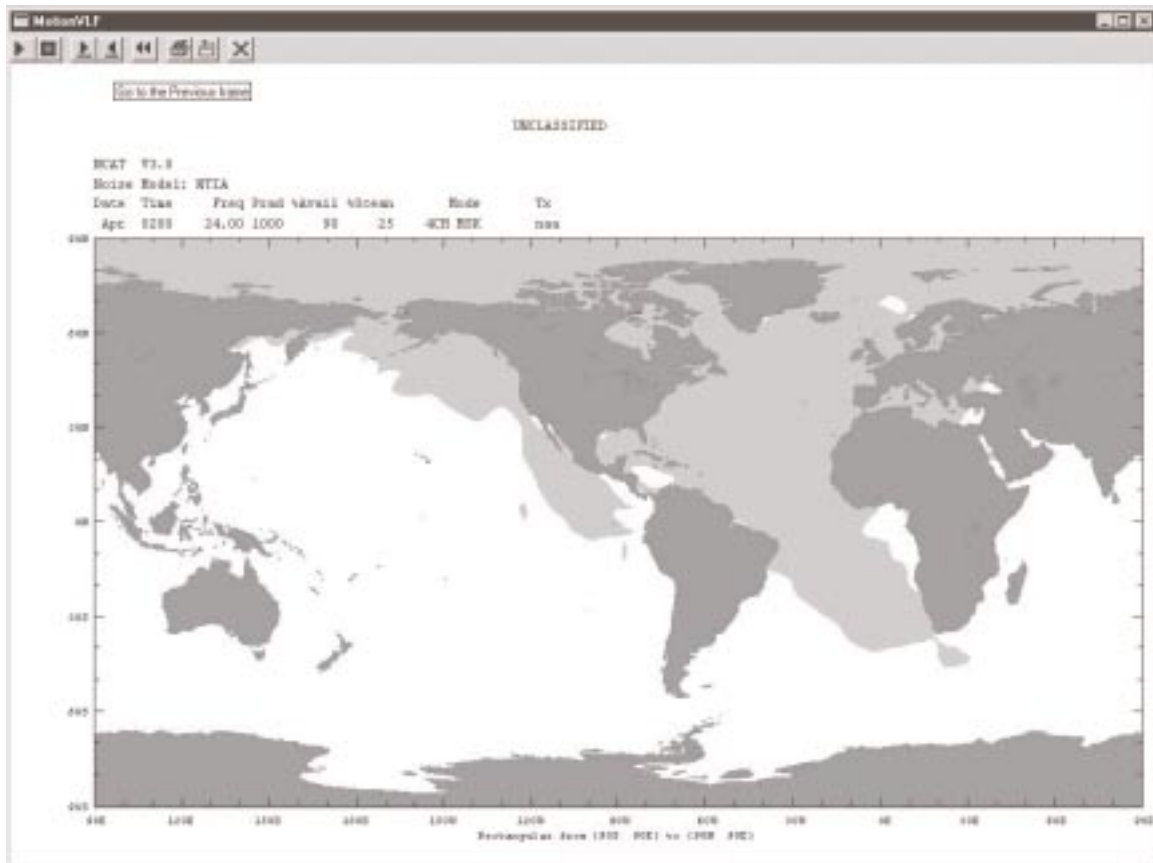menu.

Figure 27. Motion VLF screen.

9. USER PREFERENCES

This section describes the options available to the user through the program's preferences notebook pages. The preferences notebook allows the user to select values that NCAT uses each time the program starts. These selections include a default season, map area, time resolution (for coverage charts), saving selected transmitters, saving selected operating areas/receivers, selecting a default noise model, selecting a default availability level, histogram and contour color selection, and the display of the day/night terminator. To open the preferences notebook, select the *File -> Preferences...* menu item.

9.1 SEASON PREFERENCE

The Season preferences page (figure 28) allows for the selection of a default season (Sep/Oct/Nov, Dec/Jan/Feb, Mar/Apr/May, and Jun/Jul/Aug). The user can also choose to use the computer's current date to select the season.

Figure 28. Season preferences page.

9.2 MAP SELECTION

The Map Settings preference page (figure 29) allows the user to recall and save the map selected when the NCAT was last run upon restart. It allows the user to select the default map projection (for coverage charts): rectangular, gnomonic, azimuthal or orthographic. The may also select the default map type, which can be no map, a land mass map, a conductivity map, or a coastal outline map.
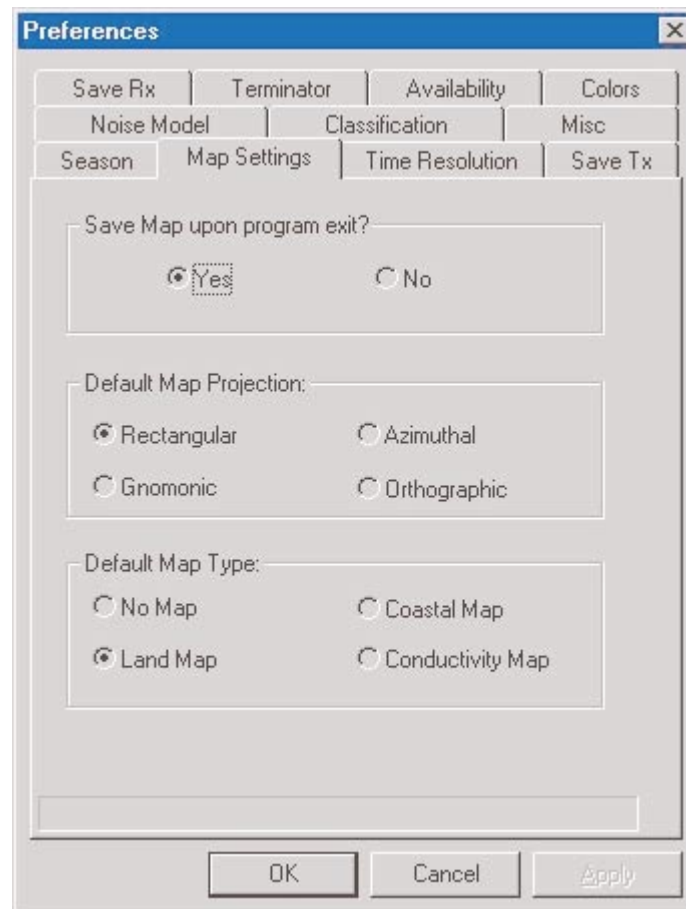

Figure 29. Map Settings preference page.

9.3 TIME RESOLUTION

The user may specify the preferred time resolution for coverage charts in the Time Resoution preference page (figure 30). The available time resolutions are 30 minutes, 1, 2, 3, 4, or every 6 hours. This preference page also permits NCAT to save the selected time resolution and use it when the NCAT is restarted.
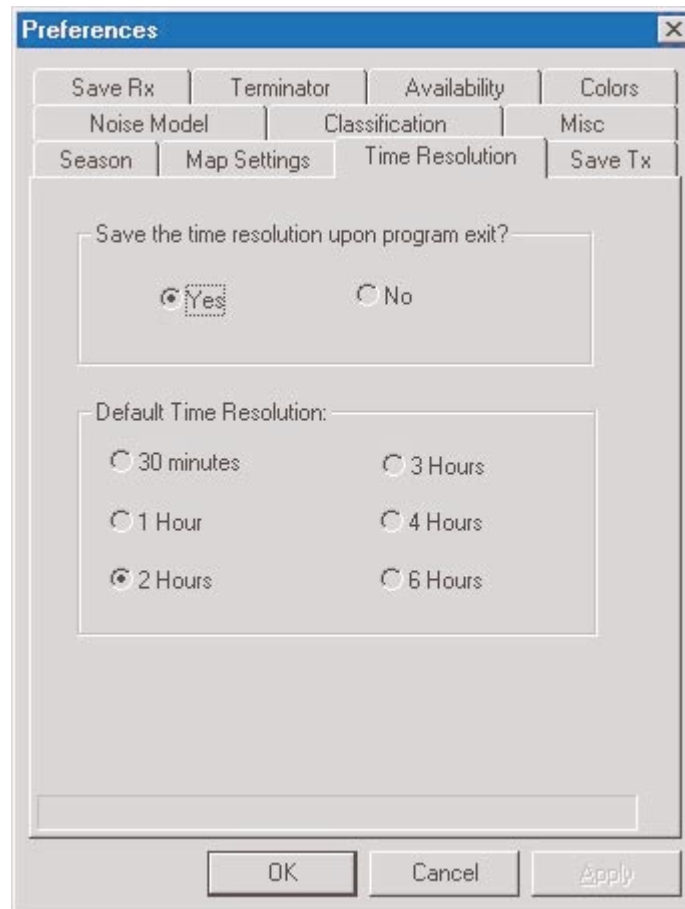

Figure 30. Time Resolution preference page.

9.4 SAVE Tx

   The user can use the Save Tx preference page (figure 31) to save the currently selected transmitters when the program exits. To save the currently selected transmitters upon exit, select the "Yes" radio button. To not save the currently selected transmitters upon exit, select the "No" radio button.

Figure 31. Save Tx preference page.

9.5 SAVE Rx

   The user can save the currently selected receivers when the program exits through the Save Rx preference page (figure 32). To save the selected receivers upon exit, select the "Yes" radio button. To not save the selected receivers upon exit, select the "No" radio button.

Figure 32. Save Rx preference page.

9.6 NOISE MODEL

The Noise Model preferences page (figure 33) determines the atmospheric noise model to be used with NCAT. Only data from the NTIA noise model is available. Data for the LNP noise model may become available later.
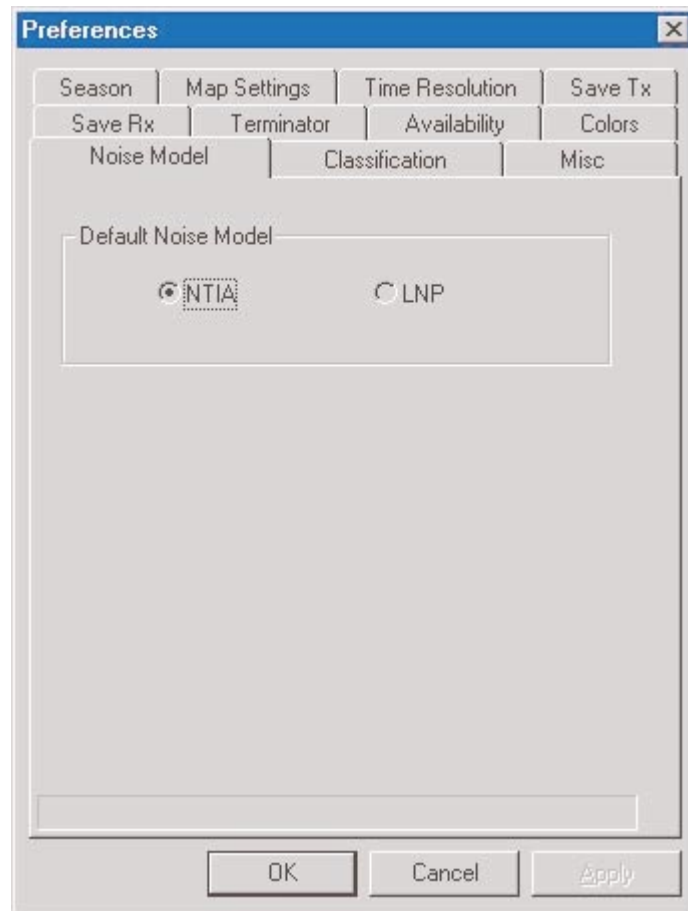

Figure 33. Noise Model preference page.

9.7 TERMINATOR

The Terminator preference page (figure 34) turns the display of the day/night terminator on or off for coverage charts. If the terminator display is on, three different displays may be selected: (1) a line only representation of the day/night terminator, (2) a filled representation of the terminator (filled areas are night), and (3) a filled area and line representation of the terminator.

Figure 34. Terminator preference page.

9.8 AVAILABILITY

The Availability preference page (figure 35) allows the user to select a default availability level. This level is used in all NCAT calculations.

Figure 35. Availability preference page.

9.9 COLOR SELECTION

The Colors preference page (figure 36) allows the user to select colors for the histogram and coverage chart displays. To modify the histogram colors, press the ***Select Histogram Colors*** button. To modify the coverage chart colors, press the ***Select Coverage Chart Colors*** button.

Figure 36. Colors preference page.

9.9.1 Histogram Color Selection

The histogram color selection allows the user to select any color for the histogram display. The currently displayed color and HPGL pen number is displayed. To change the HPGL Pen number (used when saving the output to an HPGL formatted data file), enter a new pen number in the field. To change the color, press the objects button and select a new color from the color requestor.
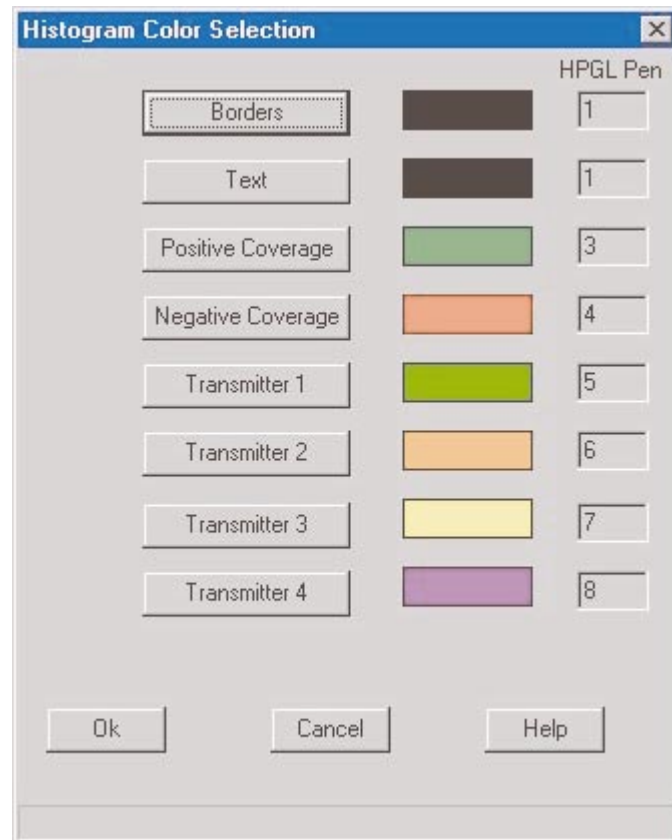

Figure 37. Histogram Color Selection preference page.

9.9.2 Coverage Chart Color Selection

The Coverage Chart Color Selection preference page allows the user to select any color for the displayed coverage chart. The currently displayed color and HPGL Pen are displayed. To change the HPGL Pen (used when saving the output to an HPGL data formatted file), enter a new pen number in the field. To change the color, press the objects button and select a new color from the color requestor.
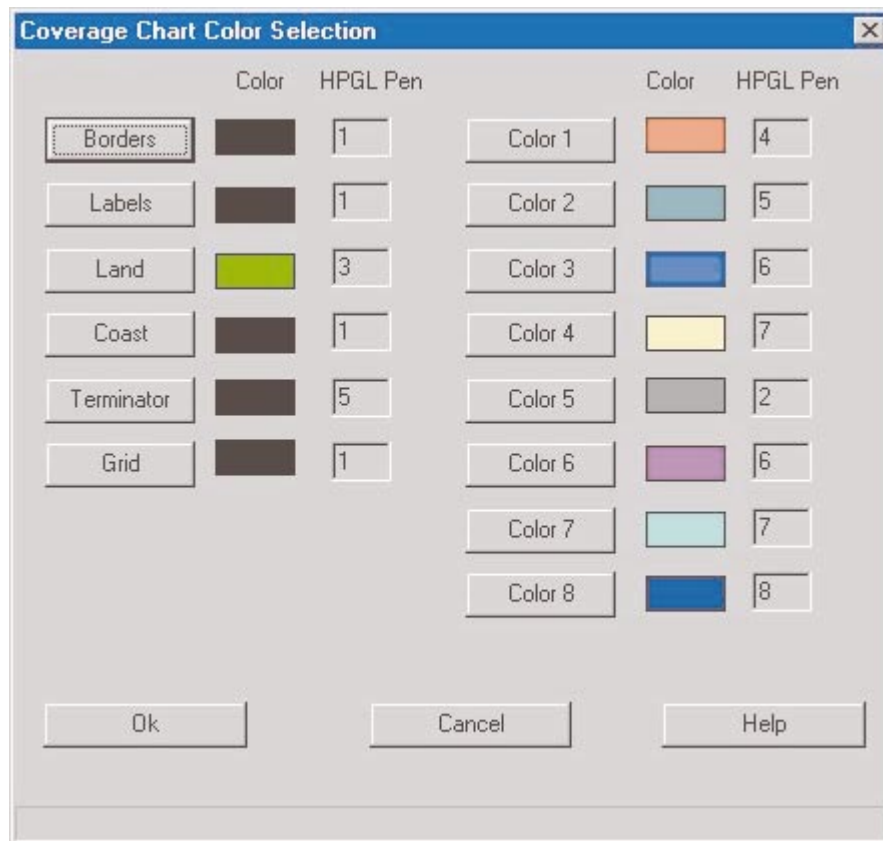

Figure 38. Coverage Chart Color Selection preference page.

9.10 MISCELLANEOUS

The Misc preferences page (figure 39) turns the automatic prompting of a label for each chart on or off. If the "Yes" button is selected, the program prompts the user for a label before generating each histogram or coverage chart. If the "No" button is selected, the program will not prompt the user for a label before generating each plot.

Figure 39. Misc preference page.

9.11 CLASSIFICATION

The Classification preference page (figure 40) allows the user to select a default classification level. Current classification selection levels include None, Unclassified, Confidential, Secret, and Top Secret.
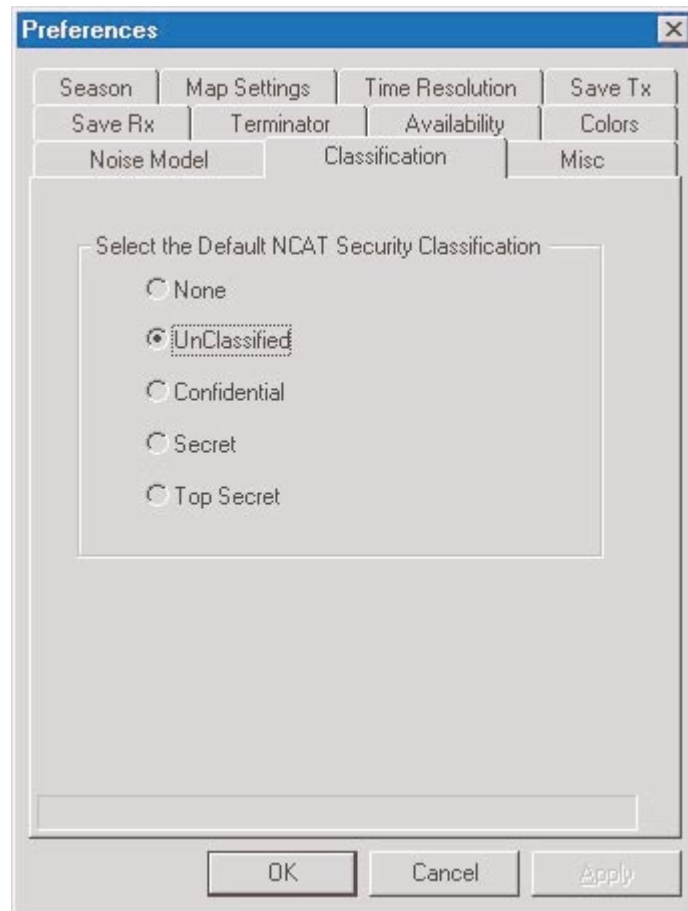
Figure 40. Classification preference page.

10. NOTES

10.1 TECHNICAL ASSISTANCE

Technical assistance can be provided. Call (619) 553-3071.

10.2 GLOSSARY

This subsection defines acronyms and abbreviations used within this document.

CPIP	Coverage Prediction Improvement Program
CPU	Central Processing Unit
CSCI	Computer Software Configuration Item
dB	Decibel
FDB	Fixed VLF/LF Data Base
FSK	Frequency Shift Keying
FVLF	Fixed Very Low Frequency
GUI	Graphical User Interface
kHz	Kilohertz
kW	Kilowatt
LF	Low Frequency
MB	Megabyte
MSK	Minimum Shift Keying
RAMRandom Access Memory	
NCAT	Navy Communications Assessment Tool
SNR	Signal-to-Noise Ratio
SV	Software Version
SVGA	Super Video Graphics Array
UG	User's Guide
VDD	Version Description Document
VLF	Very Low Frequency

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